
SIGILLVM · VNIVERSITATIS · CALIFORNIENSIS
FIAT LVX
MDCCCLXVIII
EX LIBRIS

Journal

of the

Royal Army Medical Corps

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

LIEUTENANT-COLONEL A. E. HAMERTON, C.M.G., D.S.O., R.A.M.C.

VOL. XLVI.

January—June, 1926.

JOHN BALE, SONS & DANIELSSON, Ltd.
83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W. 1

No. 1. January, 1926. Vol. XLVI.

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

LIEUTENANT-COLONEL A. E. HAMERTON, C.M.G., D.S.O., R.A.M.C.

ISSUED MONTHLY

Printed and Published by

JOHN BALE, SONS & DANIELSSON, LTD.

83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

Price Two Shillings net.

BY APPOINTMENT

Regimental Badge Jewellery.

9-ct. Gold and Enamel Brooch with Gold Snake £4 7 6

18-ct. Gold and Enamel Brooch with Rose Diamond Snake ... £7 10 0.

THE Badge illustrated is one of the many fine pieces of Jewellery produced by the Military Department of the Goldsmiths and Silversmiths Company. Whilst taking pride in the beautiful specimens fashioned by their expert craftsmen, the Company does not lose sight of the fact that plain and simple badges of Gold and Enamel are often preferred. Of these many pieces exist, bearing the same care and attention to detail and workmanship as is bestowed on all the Company's productions.

Selections sent for approval to any part of the United Kingdom.

The Goldsmiths & Silversmiths Company Ltd.

with which is incorporated The Goldsmiths Alliance Ld Estd [illegible]

No Branches. Only ONE Address.

112, Regent Street, London, W. 1.

For INDIGESTION and DYSPEPSIA

Lactopeptine

LACTOPEPTINE IS A NON-SECRET REMEDY WITH ITS FORMULA ON THE LABEL OF EACH BOTTLE

ELIXIR LACTOPEPTINE

A very palatable form of administering Lactopeptine combining the digestive properties of the latter with the stimulating effect of a pleasant aromatic tonic. Specially recommended.

THE digestive ferments (pepsin, pancreatine, diastase) used in the manufacture of Lactopeptine are of the highest grade. Although this preparation has been prescribed by the Medical Profession for over 40 years, its ingredients have been constantly improved and kept up to date by the most advanced pharmaceutical practice.

When prescribing specify in all cases Lactopeptine (Richards). Dispensed in 1 oz. (4/6) and ½ oz. (2/9) bottles, in powder or tablet form. To prevent substitution, Medical men are requested to prescribe Lactopeptine in original bottles.

Samples (powder, tablet and Elixir form) free of charge on receipt of professional card.

JOHN MORGAN RICHARDS & SONS, LTD., 46 HOLBORN VIADUCT, LONDON, E.C. 1.

VOL. XLVI. JANUARY, 1926. No. 1.

Journal

of the

Royal Army Medical Corps.

Original Communications.

THE LOAD OF THE SOLDIER: A PLEA FOR ITS HIGHER CARRIAGE.

BY CAPTAIN D. GORDON CHEYNE, M.C.
Royal Army Medical Corps.

FOR a long time there has been a tendency to place the soldier's pack, which forms a dominating part of the load carried, too low on his frame, and the purpose of this paper is to suggest that an economy of effort will result if arrangements can be made for fixing the pack higher than it is at present.

Various reasons may be given for this view. Firstly, one's own experience, and secondly, when accompanying men fully loaded on a march, it has been evident that the men themselves constantly endeavour to get the packs higher by hitching them up on to their shoulders. This all entails effort, and the additional expenditure of energy on this account alone must add very considerably to the cost of a fifteen miles march. A great deal has been written about the centre of gravity of the body and the need for placing the load round that spot. The statement that the centre of gravity of the body is somewhere between the first and second lumbar vertebræ may be true of the unloaded body or even of the perfectly loaded body, could this be arranged. It may be asked, however, Is this true for the body when loaded as in the case of the soldier, whose load must be largely asymmetrical, i.e., laterally or antero-posteriorly?

Other points which have to be taken into consideration are the effect of load on posture, for an unsuitable posture may lead to inefficiency of the respiratory mechanism. This is of great importance, for an embarrassed respiration is bound to react on the cardio-vascular system, so that a vicious circle is established. It is hoped to show that a raised load will lead to

a better posture and one more compatible with an efficient respiratory system. In this connection it should be borne in mind that maximum play of the respiratory muscles in chest expansion is obtained, not when the shoulders are braced back as in the old-fashioned "attention" posture, but when the shoulders are slightly forward, and the back not poker-like in its straightness, but with a slight arch forward.

This position probably aids respiration by facilitating the action of the abdominal muscles as accessory respiratory agents, as well as the action of the diaphragm. These two points are well exemplified in the attitude of men racing, and in the attitude of men when the respiratory capacity is being tested in the laboratory. I have never seen a man stand rigidly in the attitude of attention when this is being done. Instead he stoops slightly forward, knowing that in that position he will attain the greatest result. The same may be noticed in the case of men carrying any load. The tendency, however, of the pack as at present carried is to pull the man's shoulders back, and to arch his lumbar vertebræ, both of which limit the range of his respiratory movements. If we take the coal-heaver as an example of load carrying, it will be noted again that even if the load is carried asymmetrically, yet he appreciates the principle of high carriage and "posture." Anatomically there is justification for this principle of high carriage, for there is little movement of the back of the chest. It is firmly bound by the scapulæ, and the solid mass of muscles covering the scapulæ, the back of the neck, the shoulders and the back, leaving a greater amount of movement to be got from the front and lateral aspects of the chest, which, therefore, must be interfered with to the least possible extent.

The remaining points to be considered in regard to any pack are: amount of space covered, possible ventilation of the area covered, pressure of straps on bony points, nerves, vessels, etc., interference with movements of the arms, and interference with other parts of the equipment or clothing carried or worn.

The pack modified, as presently to be described, is simply the ordinary pack as at present used; so shape, material, ease of putting on and taking off, etc., need not be mentioned. It is believed that the amount of space covered will be materially lessened and that ventilation will, therefore, be greatly improved. This is of great value as more space will be available for the evaporation of sweat, and consequently loss of heat, than formerly was possible. This, however, can only be settled in a field trial. Previous attempts to attain this are seen in the wicker-frame which was suggested to interpose between the back and the pack. This was open to obvious objections.

Pressure is not much altered by the modified pack except that pressure on the front of the chest is reduced. The backward pull of the pack is considerably reduced, so respiration is thereby aided. The upward drag on the belt is largely reduced by putting on an axillary band attached behind to the belt.

There is no interference with any movements and the pack does not interfere with the carriage or use of the rifle, wearing of the cap, steel helmet, or solar topee, or the carriage of a gas helmet over it, as is usual in the "off-alert" occasions.

The question of the smartness of the higher carriage may be raised. Perhaps this method of carriage is not so smart as the lower carriage, but is this so important when added efficiency is taken into account? The photos which are shown were taken without any special packing, but doubtless if the pack were done up in the best Guardsman's style there

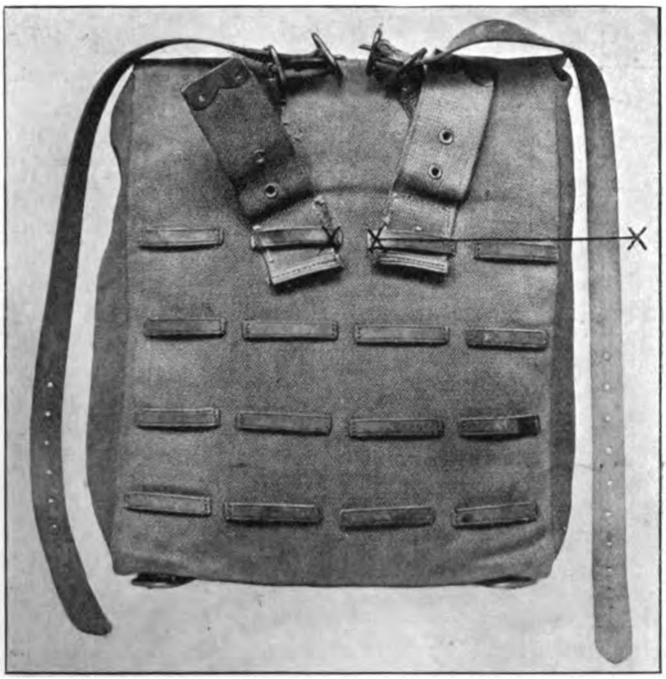


FIG. 1.

would be added smartness. But we know that the troops marching up the line fully loaded never looked really smart.

Again, it may be said that the pack, as at present constituted, is not the last word in pack construction and that a smaller article or a half-pack may at some time be substituted. This does not alter the principle which is being discussed, for even if a smaller pack were introduced, the principle of higher carriage might still be incorporated in the design. It is also well to remember that even if mechanicalization of the Army goes a great deal further than at present, there will still be many occasions, in many different places, where the soldier must be his own beast of burden. With all the mechanicalization enjoyed in the Great War, whose lessons, we are

told, should not, however, influence us too much, the private soldier was called upon to carry upwards of seventy pounds on many occasions.

Having discussed the principles involved in the higher carriage of the pack, a description of the alterations which have been carried out on the pack may now be given, together with the experimental results obtained and the subjective feelings of men when wearing the experimental pack.

An experimental pack was made, as shown in fig. 1. This is simply an ordinary pack, to the back of which were sewn several leather loops,

Fig. 2.

through which the brace-attachment to the pack could be put. After many experiments it was found that the best position was the two top and inner loops (marked × on fig. 1), i.e., roughly three inches below the existing attachments. When this pack was worn it was found, naturally, that the top of the pack tended to fall back, and it became necessary to adjust this.

Captain E. W. Wade, D.S.O., who was associated with me in the earlier experiments, suggested a strap coming off the top of the pack and brought over the top of the shoulders, and fixed by a stud to the front brace. This worked quite satisfactorily ; indeed a considerable part of the experimental

work on indirect calorimetry was done with this strap. Later it was found, however, that a better result was obtained when wider straps were used, as pressure was more evenly distributed, and when they were attached to the top of the pack and at the edges so that the pressure was well out on the shoulders. This modification is shown at Y in fig. 2.

The effects of the alterations so far described were to raise the pack higher and to reduce the amount of area of the pack actually in contact

Fig. 3.

with the man's back. The only previous attempt at this appears in the case of the Swedish pack, to which a strap is attached by which the pack may be raised by pulling the strap.

The lower end of the pack was thrown outwards, so that a larger area of the back could be freely ventilated. The area actually in contact with the pack was reduced to one of a depth of a little over three inches, extending from just below the spine of the scapula to about one inch above the inferior angle of the scapula. This area extended the whole way across the back, in view of the width of the pack. These points are well brought

out in fig. 3, which shows two men, one wearing the experimental pack, the other the ordinary pack. It will be observed that the man on the left is tilted a little forwards. The effect of this is to straighten the lumbar curve and to aid the respiratory mechanism by permitting greater action of the abdominal muscles and of the diaphragm. Separate photographs of the two men were taken, standing on the same spot, the camera being also kept on the same place for the two photographs. Tracings were made of these. The amount of tilt is shown as the shaded portion of fig. 4. As there was still some upward drag on the belt in front, it was suggested by Captain R. A. Mansell that this might be eliminated by an axillary

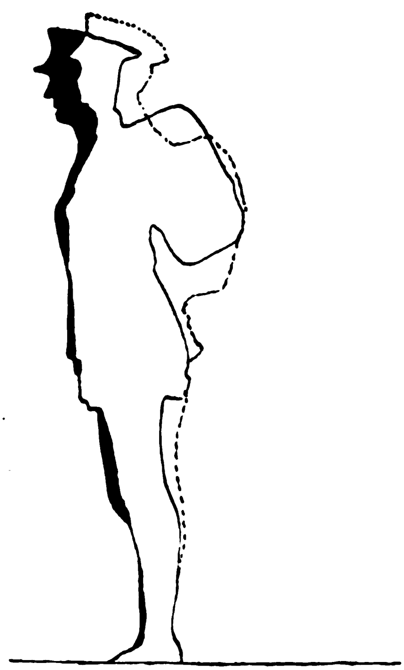


FIG. 4.—To illustrate slight forward tilt of the body when carrying modified pack.

band on lines similar to that employed by Professor Cathcart. In Professor Cathcart's experiments the axillary band was attached behind to the base of the pack. It was obviously impossible to do that in this case, as the good·effect of the ventilated space beneath the pack would be lost. Therefore the axillary band was attached behind to the belt with good results. The points of pressure and the area of the back in contact with the pack, as well as the straightening of the lumbar arch, are shown in the reproductions of radiograms taken by Major D. B. McGrigor, Officer in Charge, Radiology Department, Queen Alexandra Military Hospital, London. These were taken while the subjects assumed, as far as possible, the attitude caused by carrying the experimental and the

ordinary pack. Radiograms of a subject actually wearing a pack lose a considerable part of their value owing to the number of buckles appearing in the picture.

Experimental Work.

Volunteers were called from men attached to No. 18 Company, R.A.M.C., working in the laboratory, and I should like to take this opportunity of thanking them for the work always carried out very willingly and cheerfully. Thanks are also due to the O.C. 18th Company for placing these men at my disposal.

The pack was at first loaded with the usual equipment carried, greatcoat and underwear, so that it weighed approximately twenty-five pounds, with belt, ammunition pouches, etc. Men worked in pairs. One carried the experimental pack, the other the pack modified by the addition of the axillary straps which Professor Cathcart and Major Lothian worked with and with which they showed an economy of effort as compared with the usual pack.

The men were worked in pairs as it was difficult, for obvious reasons, to get men whose metabolism was anywhere near the basal rate. Therefore, if the basal rate tended to slow with the passage of time after the last meal, it is evident that in the case of those men who wore the experimental pack, after the other, the effect would be to the detriment of the new equipment. Taking this into account, I believe the results are comparable. Basal metabolism rates were at first calculated, but this was later given up as the pair system seemed to be adequate.

The packs were carefully adjusted as to equal weight and the men were set to march for half an hour. At the end of this time their energy expenditure was estimated by the Cathcart-Douglas-Haldane method, timed by stop-watches, the men marching to the beat of a metronome. Therefore the distance walked in the time, usually three minutes, was constant. At the end of half an hour the men changed packs and continued marching for another half-hour, when their metabolism was again estimated. The variation of economy, as shown on Table I, may be explained by the difference in adjustment, for working with one pack on a series of men of different heights means a lot of alteration, for, as is well known, to get any pack just right for its wearer means very careful adjustment and manipulation. The results show that, in a series of men not leading very active lives—most of them are laboratory assistants—there was an economy of effort while working with the experimental pack amounting to a considerable amount in some cases. This mean economy on energy expenditure in carrying the experimental pack was forty Kalories per hour. This becomes a considerable economy over a five-hours' march.

After a certain number of experiments had been done which showed a certain economy, it was decided to continue these experiments with a pack and equipment exactly corresponding with that carried under active service conditions. These two packs were loaded, therefore, with the articles

enumerated in the "Field Service Manual," 1924, Infantry Battalion Expeditionary Force, p. 24, E and F. These are as follows:—

Cap comforter	Mess tin	Soap	6 lb. $15\frac{3}{4}$ oz.
Holdall	Ground sheet	Tin oil	
Housewife	Socks	Towel	
Bread ration, unconsumed portion			3 lb. 4 oz.
Cheese			
Iron ration			

Over the pack the steel helmet was carried (2 pounds, 2 ounces) as well as the box respirator (2 pounds 15 ounces). This portion of the equipment, including weight of pack, came to 17 pounds. Seventy rounds of ammunition were carried, the water-bottle was filled with water, so that, with the haversack, bayonet and clothing worn, the weight came to 46 pounds 8 ounces. The rifle was not carried, which accounts for the difference between this weight and the weight of 55 pounds $6\frac{3}{4}$ ounces laid down in "Field Service Manual." It will be noted that the greatcoat was omitted, as it is intended that this should be carried on train transport.

Experiments were continued with this load, and the results are shown in the table, under subjects Nos. 9, 11, 12, 13, 14, 15.

TABLE SHOWING GROSS ENERGY EXPENDITURE IN CARRYING EXPERIMENTAL PACK COMPARED WITH CARRYING OLD PATTERN. WEIGHT SAME IN EACH CASE.

Subject	Net height		Net weight	Energy Expenditure		Economy per hour	Economy per min.
				Old	Modified		
No.	ft.	ins.	kgm.	K.	K.		
1	5	$8\frac{1}{3}$	62·1	317	286	31	0·5
2	5	$7\frac{5}{8}$	51·83	312	240	72	1·2
3	5	$7\frac{1}{2}$	74·0	261	222	39	0·5
4	5	5	62·0	275	227	48	0·77
5	5	$8\frac{1}{2}$	62·3	298	282	16	0·25
6	5	$8\frac{1}{2}$	61·0	300	244	56	0·93
7	5	4	52·0	267	214	53	0·93
8	5	10	60·8	318	258	60	1·0
*9	5	9	70·6	360	300	60	1·0
10	5	5	59·0	264	240	24	0·4
*11	5	9	77·0	350	312	38	0·5
*12	5	$11\frac{1}{2}$	70·0	354	342	12	0·2
*13	5	$8\frac{1}{2}$	62·0	390	369	21	0·3
*14	5	$7\frac{1}{4}$	65·0	336	276	60	1·0
*15	5	7	66·4	388	360	28	0·5

Average economy 40 K. per hour.

* These subjects carried complete equipment as laid down in the "Field Service Manual," 1924.

It is admitted that the conditions under which these experiments were conducted were somewhat artificial. A certain number of them were carried out indoors, in a well-ventilated room with a cement floor. It may be presumed, however, that even better results might be obtained under more natural conditions.

Subjective Feelings of Men carrying the Modified Pack.

Both officers and men were asked to give their views regarding the carriage of the experimental pack as compared with the older pattern. Attention was directed to the following points, upon which they were requested to comment :—

1. Weight.
2. Pressure. (*a*) On back.
   (*b*) On shoulders.
3. Drag on belt in front.
4. Ventilation of back.
5. Ease of breathing.
6. General effects.

Before the axillary bands had been put in there was apparently a tendency to drag, but afterwards this was largely eliminated. A slight drag is inevitable, unless the balance of the anterior weight—ammunition pouches, etc.—exactly corresponds with the posterior weight—pack, helmet, box respirator.

All were agreed that the experimental pack felt lighter and the pressure was localized to the upper part of the scapulæ. The pressure on the shoulders was not great, and there was little pressure in front, so that in consequence the shoulders were freer. The D-piece, by which the upper retaining strap of the pack is attached to the front brace, sometimes tended to press tightly if it had not been brought well down in front.

The coolness of the back was especially noticeable, and while with the older pack the back became sweaty, even after fifteen minutes, with the experimental pack the back kept pleasantly cool throughout the test. Respiration was easy and movements were in no way restricted. The balance and hang of the pack were very good. It is believed that the effect of the free ventilation of the back would become more apparent on a longer march.

Such points as these, and others, it is hoped to clear up in a field test.

Description of Alterations and Method of Carriage.

The alterations carried out have been as follows :—

(1) *Alterations to the Pack.*—Lowered fixation of the pack to the back brace-attachment strap. The points of attachment are now $4\frac{1}{2}$ inches from the upper edge of the pack. These are separated one inch from each other at their lower point and are sewn at an angle of 45° from the central line (see fig. 2, A). To the top of the pack, at its posterior aspect, i.e., side in contact with the man's back, are sewn two straps, eight inches long, coming off the extreme edges of the pack and running parallel to one another (fig. 2, Y).

(2) *Alterations to the Belt.*—Four additional short straps, with D-attachments, have been fixed to the back of the belt. These have been sewn to the belt, one pair at each side just external to the existing brace-attachment

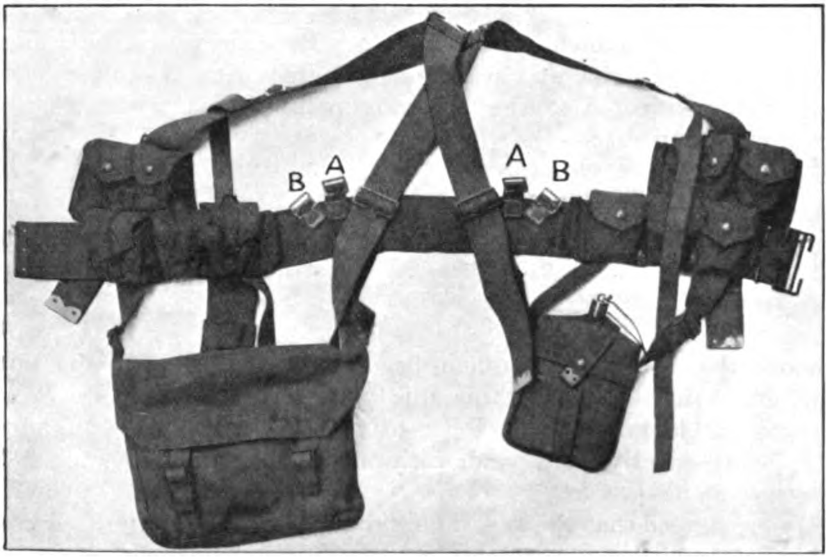


Fig. 5.

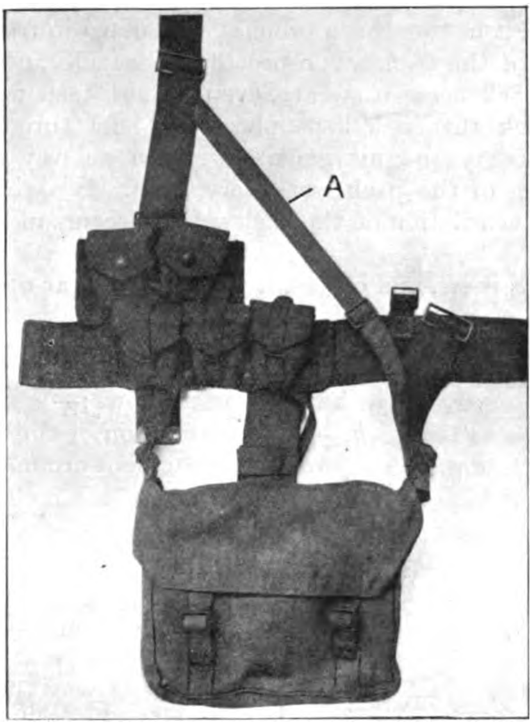


Fig. 6.

strap (fig. 5). The inner pair (fig. 5, A) are required for the strap-attachments to the lower end of the pack. These have been put in to enable men to double and lie prone on the ground, which might be required in open advance. Were these straps omitted the pack would tend to come up over the the man's head. It is not intended that these straps should be tightened up, otherwise the ventilation space will become obliterated and thus much of the benefit claimed for the modification will be lost. These retaining straps are well seen in fig. 3, B.

The external pair of D-straps (fig. 5, B) are for the adjustment of the axillary bands. These are sewn to the belt at an angle of 45°.

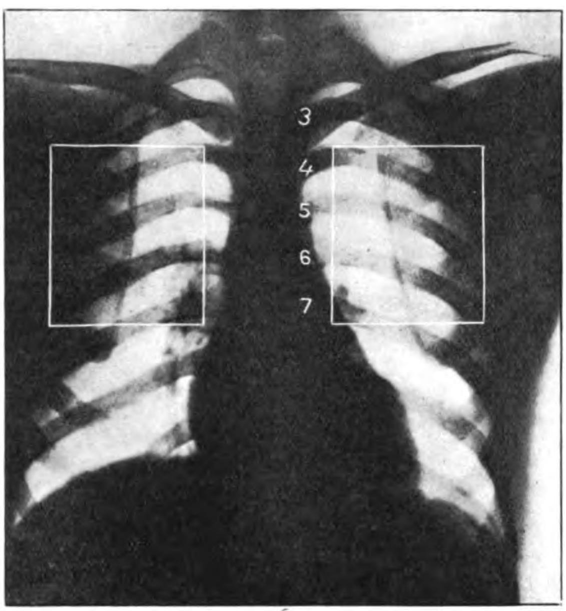


FIG. 7.—To illustrate the areas of pressure of the modified pack.

(3) *Alterations to the Braces*.—A large D is required in front through which the upper retaining pack-strap is attached. This D has not been sewn on. It should, however, be well down under the clavicles to avoid pressure from the rifle. This D can just be seen on fig. 3, C.

The axillary bands are shown on fig. 6, A. These are sewn to the front braces. Narrow webbing has been used. They have been sewn at an angle of 45° and pass under the axilla to join with the external pair of D-straps attached to the belt behind. These cause no constriction of any vessels or nerves, nor do they impede respiration. They have been put in solely to endeavour to correct in part the upward drag of the belt in front. They are stitched ten inches from one end of the brace. The belts are twelve inches long.

FIG. 8.—Showing the straightening out of the lumbar vertebræ in the posture produced in carrying the modified pack.

FIG. 9.—Showing well-marked lumbar curve produced by the pull backwards of the present pattern of pack.

Method of Carriage.

When worn, the area of the pack in contact with the body lies over the scapulæ, and the top of the pack, as seen from a back view, should be one inch below the upper margin of the collar of the tunic. When first adjusted it may be found better to have it even an inch higher than this, so that when all the belts have become adapted to the wearer's form any slight fall will bring the pack to the correct position. No apology need be offered for emphasizing these details, as everyone who has ever carried a pack will appreciate the benefits of that exactness.

In conclusion, I wish to thank Lieutenant-Colonel J. A. Anderson, R.A.M.C., Professor of Hygiene, and the Officers of the Hygiene Department, Royal Army Medical College, for their advice and help in carrying out the work entailed in this investigation.

A METHOD OF EXCRETA DISPOSAL IN THE TROPICS WHICH ENTIRELY PREVENTS FLY DISSEMINATION.

By Major A. L. OTWAY, M.B., D.P.H.

Royal Army Medical Corps.

Late Medical Officer of Health, Seccondee, Gold Coast.

Sewage disposal in the tropics has always been a thorny problem where a water carriage system is not in force, which is usually the case in this part of Africa and in India. Water carriage is the exception for reasons of finance, shortage of water supply, difficult country, etc. We are then left, for practical purposes, with two main systems :—

(1) Incineration.

(2) Earth disposal into (*a*) shallow trenches; (*b*) deep pits.

The latrines themselves can be divided into three main groups :—

(*a*) Dry closet, bucket latrines for bungalows and better class houses.

(*b*) Bucket or pan latrines for the native population, or

(*c*) Deep pit latrines for the same class.

The contents of all the buckets have to be removed to their final place of disposal by various methods of carriage, i.e., head ; cart ; motor ; suiting the local needs and labour ; and then have to be disposed of by burning or some form of earth disposal.

The main objects which the sanitarian in the tropics has in view are to prevent as far as possible flies breeding from the excreta when disposed of ; and to prevent any nuisance taking place.

Up to the present, the prevention of fly-breeding from excreta disposal places has always been our greatest difficulty and of extreme importance to carry out efficiently.

I claim to have solved the problem in a simple, inexpensive and efficient manner which meets the needs of :—

(1) The private bungalow or groups of such.

(2) A municipality.

(3) Cantonments in India in special cases.

(4) The Army, at the base or in stationary camps when at war ; or, indeed, any place where bodies of men halt for any period.

In all cases I am assuming that incineration, or water carriage, is not possible.

On taking over the duties of Medical Officer of Health, Seccondee, I found that for reasons of finance, shortage of water, extremely hilly and difficult country, the dry closet, bucket or pan, and deep pit latrines were in force. The contents of the buckets and dry closets being disposed of in :—

(*a*) Deep pits.

(*b*) The sea, or sandpits on the beach where practicable.

This system cannot at the moment be improved upon.

A water carriage system is difficult to contemplate, certainly so far as the residential area is concerned. Bungalows are perched on a series of spurs standing over, and running down to the sea. Even if water were available, it would be a costly measure.

Incineration can for the present be ruled out here.

Shallow trenching also cannot be adopted owing to the shortage of suitable ground, the hilly nature of the country, and the extremely violent rains which would wash out any such system in a few minutes.

Dumping at sea from a hopper barge cannot be done owing to the surf, etc.

Removal by motor lorry to a special area is not possible at present.

Thus we have to fall back on disposal in deep pits or trenches as our only practicable method here.

I have proved beyond doubt that flies breed in tens of thousands from :—

(*a*) Deep pits in which excrement is deposited.

(*b*) Deep pit latrines.

These pits hatch flies at all hours of the day and will, when opened to deposit fresh excrement, let out large numbers in batches. Spraying with izal, crude or diluted, has been tried, both in these deep pits and in pit latrines, and has been found to make no appreciable reduction in the breeding of flies, even when done with the most extreme care.

The main difficulties are :—

(*a*) Do what you will, flies will continue to hatch out in pits.

(*b*) Will be found as winged insects there.

(*c*) Will make their escape if and when the pit is opened, or from any aperture where light is let in.

I have proved *that the newly-developed fly makes directly for the nearest point of light* to get out and obtain food. This fact provided me with my line of attack on him.

After experimenting I found that if the pit is kept completely dark, except at the point where light is *designedly admitted*, and if a fly-trap is placed there, all flies, as they hatch out, will (this being the only light spot) go into the trap and remain there.

To prevent fly-breeding it is only necessary :—

(*a*) To construct a roof and sides over the pit area for weather protection.

(*b*) To seal over the top of the pit itself.

(*c*) To place a tight and *light-excluding* lid over the filling hole.

(*d*) To construct a fly-trap at the other end, into which all flies will inevitably go, being attracted towards the light.

(*e*) To substitute buckets or pans for pit latrines in all cases and empty their contents into "trapped pits" close at hand.

Working on these principles I have had pits constructed which fulfil all the above conditions.

Excreta disposal pits as I use them are, in general, some 15 to 20 feet long, 3 feet 6 inches to 4 feet wide, and 10 to 12 feet deep, depending on the soil, etc.

The sealing of the pit is done by placing over it bush timber joints covered with palm leaves and beaten earth called "swish," which is then tarred or treated with heavy oil. A hole is left at one end for the trap and the filling orifice is placed at the other end, and not less than six to ten feet from the trap.

The whole pit is then protected by a thatch or palm-leaf roof and sides supported on bush timber. The area protected extends some two to three

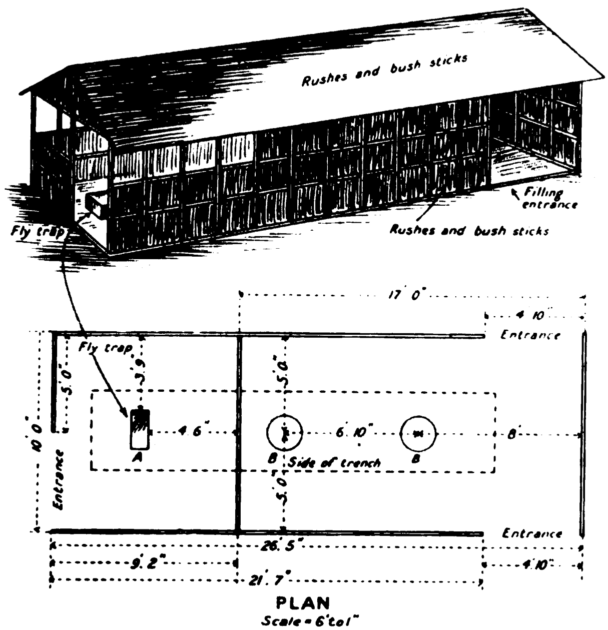


Fig. 1.—Sketch and plan of "fly-trapped pit" with two filling orifices.

feet all round the pit. In a country like the Gold Coast, where the rains are violent, it is of paramount necessity to look to the weather protection of these disposal pits; otherwise they would be washed out.

If they are constructed on the side of a steep hill, and some of mine are on gradients of 1 in 3 or thereabouts, it is also necessary to dig a "protection" drain some twenty feet above, and also to drain carefully the immediate margin of the protecting hut, or else a wash-out may take place.

Fig. 1 shows the construction of such a closed "fly-trapped" pit for the contents of latrine buckets; the detail of the fly-trap is given in fig. 2.

The trap is constructed as follows :—

The top is taken off a wood 8-gallon petrol case, size 20½ inches by 10½ inches by 14½ inches.

In the centre of the bottom a six-inch circular hole is cut.

A copper gauze cone is made after the fashion of a lamp shade, bottom diameter 7 inches, top 3 inches, height 5 inches, and is then fixed with its broad end over the hole and projecting up into the box; a few small nails do this.

Copper gauze is then stretched over the top of the box and fastened round the edges with wood battens; this is necessary because it will be found that wherever the netting is loose at the edge and seems to offer chance of escape, the flies will be found there in a tightly packed mass, and will finally worm their way underneath.

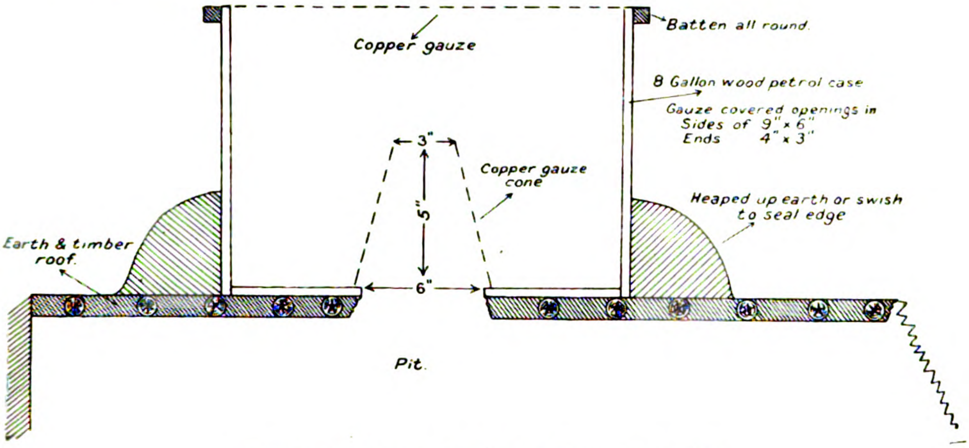


FIG 2.—Fly-trap. Detailed sketch. Elevation.

Two openings 9 inches by 6 inches are made in the sides, and two of 4 inches by 3 inches in the ends of the trap, and covered with gauze; these greatly help observation of the flies from the top, as it is difficult to see the flies looking through the gauze or netting from light towards darkness. A side and an end opening are made with gauze on a wood frame, which is *screwed* on to the outside of the box. The larger opening in the side is to enable the trap to be emptied without removing it, and the smaller one in the end is for catching samples.

It is important to remember not to let any gauze project beyond the bottom of the box at the edge of the wood circle, as if anything in the nature of a loose edging occurs the flies get trapped on the under edge of the box and so are prevented from getting into the trap.

Make the gauze cone by first cutting a paper pattern just like a "Peter Pan" collar; then cut the gauze and bend it till the edges overlap and join up with a piece of copper wire interwoven in the mesh. This makes a strong and perfect cone.

I have actually made the filling orifice out of a dustbin from which I removed the bottom. This was sunk down nearly to floor level and had an excellent tight-fitting lid. It, as a matter of fact, was suggested by one of my African inspectors, and is an improvement on the corrugated iron lid, originally devised by me, as it is more fool proof and sanitary.

I have had the lid covered with a loose fitting tarred canvas cover through which the handle projects. This is to prevent any possibility of light entering round the rim should the cover not fit perfectly or not be placed exactly in position.

I placed the extra canvas or sacking cover on the lid for the following reasons:—

One day on opening the lid to look into the pit and see if any flies would come out, I found that some did so, actually some twenty in a bunch. This caused me to suspect that there musc be some tiny point of light at the filling orifice which attracted a few flies. This proved to be the case, and the lid was found to fit badly in one place, though not leaving a space for flies to get out.

I had another pit under construction and approaching completion, so I and my Superintending Sanitary Inspector, Mr. P. P. Horn, to whom I owe much for his enthusiastic support, determined to go down into this clean pit and there be sealed up with the fly-trap and filling aperture fitted. In other words we wanted to see "what the fly sees." We particularly wanted to know how much light came into the pit and if the "light spot" was plain at every part of it.

After the trap and dustbin lid had been placed in position and we had been "sealed in," it was at once apparent that the trap let in far more light than we had imagined. Looking up at the six-inch opening covered with its gauze cone was rather like looking at the port-hole of a ship. The whole pit was very fairly illuminated and I think we could have read a newspaper with comparative ease ten feet or so away from the trap end.

Here it should be noted that it is very necessary when constructing the sides of the hut which covers the pit, to have windows in the sides near the trap so as to let bright light fall directly on it. Half sides for four feet and half, the end being open, let in enough light. In the later models this part of the hut is left completely open to get the maximum light (see fig. 3).

We then went and scrutinized the filling orifice from below. It could be plainly observed that there was a comparatively large line of light all round the dustbin lid, even though the lid was a new and apparently tight-fitting one.

The reflection from the zinc made the line of light look very plain.

This observation proved definitely to me why those twenty or so flies had come out. They had been side-tracked.

Looking down on the same pit from the outside through the gauze cone it seems as if one were looking into black darkness, but this is not really the case, as our experience proves.

I called to my African inspector and asked him to throw his coat on the lid, which he did, making complete darkness. This result caused me to devise the extra canvas or sacking cover, and the dividing partition. Any pit-filling orifice can now be opened and no flies come out; all being at the lighted end or caught in the trap.

A further improvement which I am now using is to divide the hut into two compartments. The one where filling takes place is kept dark and the other as light as possible (fig. 3).

The darkness of the filling chamber compensates for an ill-fitting or badly-adjusted lid.

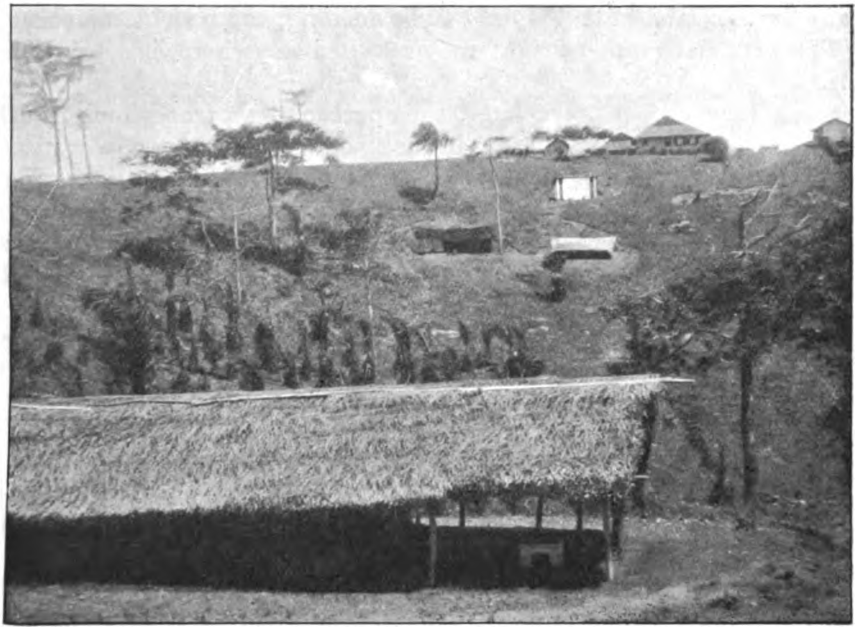


Fig. 3.—In the near foreground will be seen a completed pit with a trap in position. At the far side of the valley are two others close to the bungalow area.

It is very necessary to keep the filling orifice at least six to ten feet from the trap so that any "loose flies" at the trap will not notice that the pit is open.

The fly-trap on these pits has proved a success—one can with certainty state that all flies hatching out go into the trap.

The first trap we put into position caused us much excitement, as I was not quite certain if my theory of "light attraction" for flies would prove correct. The happiest results followed—the gauze-covered trap became almost immediately filled with a mass of humming flies, *steadily increasing in number* and anxious to get out. It was very

interesting to notice that some four or five hours later many flies were lying dead on the floor of the trap, thus showing that if the insect does not get nourishment almost immediately after hatching out, it will die.

So far as I know, the principle of making an artificial point of light in such pits *is a new one*, making use as it does of the natural attraction that light has for the fly at this stage. Since leaving Africa I have found that a balloon fly-trap has been attached to the lids of garbage cans, the idea being that flies in these receptacles would be attracted by the light and go into the trap.

It can easily be used, with modification, in many other such places to prevent flies escaping.

For example, it can be applied to manure heaps, by placing the manure in any dark pit and having a light-tight opening, and trap at the other end.

The artificial point of light may be sited anywhere, i.e., top, sides or ends.

Some four or five days later, on approaching a trap which had been placed on a pit that had been in use some time, one could hear the humming of the flies in it. When one looked into it, one saw on the floor a densely packed mass of dead and dying flies, probably an inch or more in depth. The remainder of the box contained a myriad of buzzing flies, all of which, of course, die, and cannot complete their cycle of existence.

I removed one trap which had been in position some five or six weeks, and contained a multitude of flies.

I took it off and substituted another for two reasons:—

(*a*) To do an actual count of the number of flies it contained.

(*b*) To classify them and determine their relative proportions.

As to the actual numbers, let not the reader think that I am exaggerating, the count was made by three people. We measured three and a half gallons of flies. Assuming that Byam and Archibald are correct in stating that there are 10,000 flies to a pint, then, in that trap there were 276,000 flies—a number which appals one. How many would they have bred if they had escaped?

Other traps in position promise even better results; they are all filling in the same way. Since this article went to press many traps caught 250,000 flies and over in five to six days! It was difficult to see into one trap as there were so many flies inside the gauze, and when the trap was emptied out on to newspapers the *very large heap of flies* somewhat took us aback. About 2,000 flies were closely scrutinized taking samples at random from the heap with the following results:—

Four species were identified:—

(1) *Lucilia cæsar* (Green-bottle).

(2) *Calliphora vomitoria.*

(3) *M. domestica.*

(4) *Sarcophaga.*

Lucilia cæsar and *Calliphora vomitoria* predominated in about equal numbers; then followed *M. domestica.* The two former were about seventy times as numerous as the house-fly. Only two specimens of the *Sarcophaga* were found. Later this species was found in larger numbers.

It is obvious that such traps can be used for scientific investigation to classify flies bred in excreta, and to determine the bacteria, etc., carried by them; in addition to which invaluable information can be obtained as to length of time taken to breed out, etc. Up to date, I have determined that flies breed out here in some eleven days; this fact being ascertained by putting a trap on a newly-opened pit.

To change a full trap for an empty one, the procedure is as follows: When it is dark the new trap is taken to the pit and a hurricane lamp is placed ten to fifteen feet away—the less light the better.

The full trap is lifted gently and a piece of sacking or cloth inserted under it edgewise.

The new trap is held ready in the hands of an assistant. On the word "Go!" the old trap is whisked off, and the new one is on in about two seconds.

The change can be made equally well in daylight, by fitting a shutter under the trap so as to close the pit temporarily.

Some interesting facts are emerging. One trap for example contained a great number of flies. A species of minute black ant found them out, passed through the gauze and then proceeded to pull dead and dying flies to pieces and take them back through it. My mind was thus relieved of any chance of that trap over filling.

The next stage in the same trap was still more interesting. *There were no flies in it at all,* but instead, the trap was full of hundreds of cockroaches, and the under side of the gauze cone was covered with a mass of these intelligent but very repulsive insects waiting to come out.

Another trap contained thousands of flies; then came the cockroaches, who presumably ate them, as they vanished!

It appears therefore certain that cockroaches breed in these pits.

Their appearance in the trap is very disgusting, and, when disturbed, the rustle of their wings is revolting to a degree.

I have not yet arrived at a precise solution of the above problem in natural history. These are the only traps in which cockroaches have appeared. All others are full of flies.

Many visitors, ladies, doctors and laymen, have been to see these pits. All have been equally horrified at what I have shown them. All agree that there is no offensive odour whatever, and only a very faint mouldy smell can be detected under the roof. It is thus apparent that the system is one suitable for use near private dwellings, and I am now so using it for groups of bungalows. The installation of this scheme of "fly trapped" excreta pits, and the substitution of pail for pit latrines, with disposal into "trapped pits," has produced remarkable effects. The

number of flies present in the area under review has been reduced to a negligible quantity; with the concomitant results of non-infected food and comfort to the population.

I wish to thank Dr. G. Hungerford, the Honourable acting Director of Medical and Sanitary Services, Gold Coast, Accra, for permission to publish this article, and to thank him, together with Dr. G. J. Pirie, Deputy Director of Sanitary Services, Gold Coast, Accra, for the personal encouragement I have received in my experiments.

My thanks are also due to Dr. W. A. Young, the Director, Medical Research Institute, Accra, for his help in classifying flies.

SOME NOTES ON CANINE RABIES.

By Major J. E. M. BOYD, M.C.
Royal Army Medical Corps.

Whilst in Dagshai, Simla Hills, during the summer of 1924, I had experience of an outbreak of rabies in dogs, so perhaps a few notes on this disease may prove of interest, especially to those members of the Corps who have not as yet served in a country where this disease is prevalent.

The disease is very common in India, and between the years 1912 and 1916, over 22,500 persons were treated at the Pasteur Institute, Kasauli.

The chief biting animals were dogs (18,020), jackals (4,159), horses (114), human beings (80); some of the others in the list being monkeys (13), leopards (8), hyena (2), pig (1) and elephant (1). Numerous other animals are also mentioned.

First it may be well to give a definition of rabies. "Rabies or canine madness is an acute disease of the central nervous system occurring in dogs and allied animals and transmitted from animal to animal by means of bites. Man and domesticated animals participate in the disease only, as a rule, by chance. The term 'hydrophobia' should be confined to the disease as met with in man only, as the fear of water is not seen in the lower animals."

The causative agent of rabies has not yet been identified, but there is no doubt that it is a living organism.

In the body of a rabid animal the virus is found in the nervous system, that is to say, in the brain, spinal cord and large nerves; also in the salivary glands and in certain of the internal organs, such as the pancreas and suprarenal glands. For practical purposes the blood, milk and other structures of the body, such as bone, muscles, etc., do not contain the virus in sufficient quantities to convey the infection.

The danger of infection from the central nervous system only applies to those who, as medical officers, have occasion to open the skull of a rabid animal in order to remove the brain, and whilst doing so inoculate themselves by an infected knife or similar means.

The virus passes from the brain into the salivary glands, and thence into the saliva of the infected animal.

Before another animal or man can become infected, the saliva must gain entrance into the body, through some broken surface of the skin or abraded mucous membrane.

The most common method of infection is due to bites, the chance of infection through cuts and abrasions is much less.

It is very important to know at what stage of the disease the virus

enters the saliva. By experiment it has been proved that the saliva is never infectious earlier than seventy-two hours before definite symptoms appear, though one case is recorded in which the saliva was believed to be infective six days before symptoms appeared in the biting animal. Once symptoms have appeared, the animal rarely lives longer than two to four days.

Therefore, if the biting animal remains alive and well for ten days after biting a human being, the saliva cannot have been infective and treatment in such cases is not considered necessary.

The incubation period of rabies, that is to say, the interval of time that elapses between the bite of the rabid animal and the onset of the earliest symptoms in the bitten animal, is extremely variable. The disease does not show until the virus has reached the brain and spinal cord and has set up sufficient changes in these structures to cause symptoms. This variation is due to two probable factors, first, to the variations in the dose of virus inoculated, and secondly, to the proximity of the bite to the brain. Bites of the face and upper extremity are, therefore, especially dangerous and should be treated with as little delay as possible.

The incubation period varies in the dog from about sixteen to ninety days. The majority of cases in the dog show symptoms between the twenty-fifth and fifty-fifth day after the bite, very occasionally the incubation period is longer than three months.

For this reason a dog or other animal which has been bitten should be segregated for at least three months and kept under careful observation for another three months.

Two types of rabies are described in dogs; the "dumb or paralytic" type and the "furious" type.

For descriptive purposes the symptoms may be classified under two main headings, brain irritation and paralysis.

The earliest symptoms observed are those of brain irritation and are as follows:—

(1) Restlessness, as shown by the animal straying from home or aimlessly wandering up and down the room and at times hiding away in dark corners. In well-kept dogs this is often missed, as the dog continually comes up to be petted.

(2) Hallucinations, as snapping at imaginary objects. In well-cared-for dogs the eating of filth may be looked upon as a very characteristic symptom.

(3) Fury: this varies with the type of dog; the pariah dog will attack any man or animal who happens to cross its path, whereas, in the well-kept dog fury is, as a rule, only vented on inanimate objects, such as its bedding or the post to which it is chained. Such a dog almost invariably becomes quiet on the approach of its master. It may attack other animals, but rarely viciously bites human beings. The most it will do, in most cases, is to grip the hand of its master and inflict a trifling wound.

(4) Convulsions : these affect the whole body, but do not usually appear until paralysis has set in and is well marked. In young dogs, convulsions appear early in the disease and cause death within a few hours from their onset.

Other early signs are :—

Fever, accompanied by a rapid pulse.

Increased salivation, which may or may not be present.

Redness of the conjunctiva.

Wrinkling of the forehead and eyebrows, giving the dog a hunted expression.

Paralysis usually follows the symptoms of brain irritation. It usually commences with paralysis of the hind legs and may be preceded or followed by paralysis of the throat and laryngeal muscles, the latter causing a change in the type of the dog's bark.

The paralysis extends to the jaw muscles, and the lower jaw finally drops.

Once definite symptoms appear life is rarely prolonged for more than two to five days.

The following signs and symptoms, as being indicative of rabies in the dog, are relied upon :—

(1) The short duration of the disease, two to five days.

(2) The certain termination of the disease in death.

(3) In well-kept dogs increased affection, hallucinations, "bone in the throat," and paralysis of the hind limbs.

(4) In pariah dogs, the number of persons or animals bitten at the same time as the patient, and the attack being without provocation.

The erroneous picture that has been imprinted on the mind of the public, that of a mad dog running down the road, sheering off to one side on seeing a puddle of water, is purely a mythical one. This popular error has arisen from the use of the term "hydrophobia," the alternative name for the disease as it is met with among human beings, in whom the sign is invariably present.

The differential diagnosis of rabies, owing to the variable symptoms, is at times rather difficult as the following diseases, in dogs, present symptoms which may lead to a wrong diagnosis being made.

(1) Distemper : The term "distemper" does not imply a single disease but is applied generally to any acute bacterial disease that affects young dogs. The recognized symptoms are as follows : (*a*) An acute catarrhal disease affecting the mucous surfaces of the nose, eyes and throat. It usually affects young animals, but adult dogs, which have not had an attack, may be infected. It occurs in epidemics, and is met with during the months of October to April. The symptoms begin with high fever, running from the nose and mouth, the discharge being at first clear but later becoming purulent. The infection may spread to the meninges through the nose, causing meningitis ; or down the trachea, causing a broncho-pneumonia.

The disease is very often fatal. (*b*) Intestinal form. This begins with fever and diarrhœa, the motions are black in colour, and sometimes tinged with blood or mucus. (*c*) Meningeal form. This is usually a late stage of the catarrhal form. The hind limbs become paralysed, and finally the paralysis extends to all parts of the body. The diagnosis is made by the presence of a purulent discharge from the nose and eyes.

(2) Pseudo-rabies of Zwick and Zeller: This disease is seen in epidemic form and is transmitted from animal to animal by means of bites. The incubation period is from two to five days; in rabies the incubation period is never less than fourteen days. The symptoms commence with twitchings of the muscles in the neighbourhood of the bite, and gradually become more and more violent and finally come to affect all the muscles of the body. In this stage there is increased salivation, and fury is often exhibited. The animal often dies in one of these convulsive seizures.

(3) Pyocyaneus disease often affects young animals, and the symptoms closely simulate rabies. The only means of differential diagnosis is by blood-culture and recovery of the pyocyaneus bacillus.

(4) Snake poisoning: (*a*) With colubrine snakes, e.g., the cobra, krait, etc. Within a couple of hours after the bite the animal begins to appear drowsy; the upper eyelids drop, the lower jaw hangs down and finally complete paralysis occurs. Death takes place within two to six hours by paralysis of the respiratory muscles. The heart often goes on beating for some minutes after respiration has ceased. There are practically no local signs or symptoms seen at the site of the bite, but the bitten limb is the first to show evidence of paralysis, often within three minutes after the bite. (*b*) With viperine snakes, e.g., Russell's viper, echis, etc. If the venom has been injected into a vein, death takes place from generalized convulsions within five to fifteen minutes of the bite, but if the venom has only been inoculated under the skin, the local symptoms are marked and characteristic of the action of the venoms of this family of snakes.

There is great pain, swelling and tenderness of the limb, occurring within a few minutes of the bite. After a short time a continuous oozing of blood occurs from the punctures caused by the fangs.

If the dose is a large one, death occurs from intravascular coagulation, or by heart failure. If the dose is small, death may be delayed for one to three days and is caused by the numerous hæmorrhages which occur from all mucous surfaces.

In all cases of viperine bites the inoculation site becomes gangrenous.

(5) Tetanus: This disease is characterized by generalized spasms all over the body and by rigidity of the jaw muscles. This latter sign differentiates it from rabies. After death, the finding of "Negri bodies" in large numbers in the brain is diagnostic, as they are only found in large numbers in cases of rabies. The Negri body is not, however, the parasite of rabies and its occurrence in the ganglion cells of the brain is met with in other diseases as it is a structure produced by the degeneration of the

nuclei of nerve-cells. Therefore, if large numbers are seen the case is rabies, but absence of these bodies does not preclude the disease.

A sad story used to be told of a dear old lady who sent her dog up to the Pasteur Institute for examination; after a few days she received the following report:—

"On examining the brain of your dog for rabies it was found that it was not suffering from the disease; needless to add your dog is dead."

Whenever possible, the brain of the biting dog should be sent for examination, that is to say, if the dog has been killed, but in no case should a suspected animal be killed, unless it is very savage; it should be kept chained up, under observation, for ten days.

The course of treatment lasts for fourteen days, and consists of daily hypodermic inoculation of five cubic centimetres of a carbolized emulsion of the rabies virus on each side of the abdomen.

Whilst under treatment excessive exercise, such as tennis, dancing, etc., and the taking of alcohol should be avoided, warm clothing should be worn in the hills, so as to prevent the danger of chills; there is no restriction as regards diet. The same precautions should be observed for ten days after the completion of the treatment.

Having given the above information, a report on the actual outbreak at Dagshai follows:—

On May 17 it was reported to me that a dog belonging to Lance-Cpl. M——, R. S. Fusiliers, had "gone mad" on the previous day, so the usual warning notes were sent out to all concerned. Roughly they were as follows:—

A "mad" dog having been reported in the cantonment area, the following precautions are considered necessary:—

(1) All persons who have been bitten or licked by the dog should report at once at the B.S.H.

(2) All dogs bitten by the rabid animal should be destroyed immediately, or must be kept chained up, away from all persons, dogs or other animals, for a period of six months. As the animal concerned in this case was obviously rabid, destruction of bitten dogs is strongly recommended.

(3) All dogs living in the block with the rabid dog must be considered a probable contact, and treated as in (2).

(4) Any dog that seems to be ill in any way is to be brought up to the B.S.H. at once.

(5) Every case of dog-bite to be reported at once, the victim to have the bite cauterized and the dog to be brought up daily for ten days for inspection, in such a way as to prevent it biting or coming in contact with persons or other dogs. The dog must also be perfectly isolated.

(6) Unless obviously dangerous, no dog suspected of rabies is to be destroyed, it must be kept tied up in a safe place, under the observation of a veterinary or medical officer for ten days; if the dog dies or has to be

shot the body must be brought to the B.S.H. so that its brain can be removed for examination. On no account is the body of such a dog to be burnt or buried until the brain has been removed.

The result of these instructions was that three men with their wives and five children were sent to Kasauli for treatment, and several dogs were destroyed, but, as will be seen later, some of the dogs apparently escaped.

The history of the infection of this dog is of interest, as it shows what is liable to happen if any slackness is allowed in dealing with these cases.

The dog was bitten by a rabid dog belonging to Serjt. N——, R. S. Fusiliers, at Sialkot, about March 28, 1924.

The child of Serjt. N—— was bitten at the same time, and later died of rabies. The bitten dog showed signs of rabies on May 15, ran from No. 21 Block to Nos. 1 and 2 Blocks, where it bit several other dogs. It was next seen at the boys' school at Sanaur, about seven miles away. A large number of boys at the school were also sent to be treated at Kasauli.

The dog was killed, and examination of the brain proved positive to rabies.

The second case occurred on June 7, when a dog bitten on June 15 by an unknown dog (? the above) appeared sick on June 3, was shot on June 4, but not reported until the 7th of the month. The body was dug up, but the brain was found to have decomposed.

In this case one man, one woman, two children and two Indians were treated at Kasauli.

The third case was on June 21. An unknown pariah dog ran over the hill on which the officers lived, was seen with the dog of the O.C. Station, but did not bite it. It next went to the S.S.O.'s bungalow, where there were eleven dogs, and where one bull terrier was badly bitten. From here it ran on to the other hill, on which the troops live, and was seen to bite several other dogs. It was killed and the brain found to be "doubtful, contacts recommended for treatment." The S.S.O. had washed his dog's bite almost as soon as it had been inflicted, and on being asked the Director of the Pasteur Institute recommended treatment. The S.S.O. was the only person treated in this case.

The fourth suspected dog belonged to a bandsman in the 2nd K.O.Y.L.I., and appeared sick on June 17, would not eat or drink, refused exercise, and had been in contact with another dog in the same barrack-room, which "became sick, frothed at the mouth and had been killed" about fourteen days before. This dog had also been killed, on June 21, the body having been burnt, as on the 20th it had refused all food and drink, and was paralysed and unable to walk.

This case shows well what the authorities have to contend with ; here was a dog off its food, paralysed and undoubtedly ill, yet, in spite of all warning nothing was reported until after the body had been

destroyed. Luckily it was a pet dog, and so no one other than its master had been in contact with it. In this case only the owner was sent for treatment.

The fifth dog belonged to a storeman in the 2nd K.O.Y.L.I. It was first noticed to be ill on June 18, but no report was made until the 23rd, on which date it was brought up to me for inspection; by this time it had paralysis of the lower jaw, protrusion of the tongue and redness of the conjunctivæ, so it was shot at once to put it out of its misery. Examination of the brain proved positive to rabies.

The history of this dog was that it seemed ill on the 18th, being timid and refusing to eat, and gradually became worse until the 22nd, when the tongue was seen to be hanging out and the lower jaw dropping; on the 23rd it was shot. It had been bitten thirty, fourteen and ten days previously by dogs which, in the two latter cases, were unknown. Here again we had a pet dog to deal with, which lived in the company store with its master, so treatment was only necessary for the latter.

A dhobi in the Suddar bazaar was the owner of the sixth dog, reported on June 25. The dog had been ill for two days, had refused food and drink, and was unable to walk. Shot on June 26, brain sent to Kasauli, where it was found positive to rabies. No one sent for treatment.

A seventh case occurred on August 6: the dog belonging to a milkman at the Government dairy suddenly became savage. It ran into the detention barracks and bit a dog, later biting another dog at the coffee shop, after which it ran away and was not seen for three days. It was shot, the man who shot it reporting that it seemed dazed and had its tongue hanging out. The body was destroyed, so that no examination of the brain was possible.

This dog did not, as far as is known, bite any human beings.

The next case to be reported, the eighth of the series, was on August 22, the dog belonged to a private in the 2nd Battalion the Northamptonshire Regiment. It had been at Dagshai for the whole of the hot weather, and had always been bad tempered and inclined to bite people; two months previously it had fought two dogs in the barrack-room, but there was no record of any dog having been recently bitten by it.

On July 30 it bit Serjt. L—— of the same unit, was seen daily for ten days, and as it seemed quite well was released from control. On July 22 it bit its owner and was shot.

The owner took the brain to Kasauli, where examination proved positive. It was not considered necessary by the Director, Pasteur Institute, for Serjt. L—— to go for treatment.

The ninth case occurred on September 8, the wife and two children of a Staff-Serjt. of the M.E.S. being either bitten or licked by a dog. This case caused a considerable amount of trouble and worry, as the owner of the dog, the Staff-Serjeant, had come up to Dagshai in order to take his wife and family away, permission being refused on medical grounds. The whole party left the same evening, being bitten in the interval.

The brain proved positive on examination, and eventually the family was located at Rawal Pindi and sent back to Kasauli.

I do not know if any disciplinary action was taken in the matter, but judging from the numerous cases of wives and children leaving without permission, probably nothing was done.

The last case was reported from the bazaar a few days before the depot closed, and so no report on the brain was received. The report on the case was briefly as follows. On October 4 an unknown dog ran through the bazaar and bit two Indian men, one woman and one child; later five dogs were brought in that had been bitten. The bitten men, woman and child were sent for treatment, and most of the dogs shot, but, as the owner of one refused to allow his dog to be killed, he was told he must keep it tied up for six months.

This concluded the series of cases, which may or may not have been due to the fact that a dog, known to have been bitten by a rabid animal in March, had been allowed at large.

Prior to the July reliefs taking place a letter was sent to the headquarters of the Brigade area concerned, recommending that all movements of dogs to and from the plains should be forbidden, as Dagshai was an infected station as far as dogs were concerned. This was changed at one of the numerous offices through which it passed to the effect that "no dogs are to be taken up to Dagshai; any dogs brought down from that station are to be kept chained up until such a time as a veterinary officer may sanction their release." If any notice was taken of the latter part of the order at all, the duration of restraint was, probably, at the most a few days, after which, owing to the hot weather, the order was probably forgotten. It would have also been of interest to know how many dogs were seen by a veterinary officer.

The finding of an old Brigade order, published last year, has led to the writing of the above notes, as the order was, to say the least, misleading, the wording being to the effect that a mad dog ran through a certain area on a given date, any dog bitten on that date was to be destroyed at once, and all dogs in the area were to be kept tied up for ten days; any dog found loose in the given area within ten days was to be shot.

I pointed out that the order was quite illegal, as dogs, being private property, cannot be destroyed "by order" unless ill, as even the best behaved dog will stray at times, but the illegality of the order was much less serious than the part dealing with restraint of the possibly infected dog, as, on reading the order, people might imagine that their dogs were not likely to develop rabies after a period of ten days, and so would not pay any further attention to their behaviour.

It was explained to me that everyone concerned knew quite well that ten days was an insufficient period, but that as it was not possible to have all likely contacts of the dog kept tied up for a longer period than ten days,

this limit had been fixed on ; as this form of reasoning was too deep for me, and as the matter had only been brought up casually it was allowed to drop. I had not been in the station at the time, so the order had nothing to do with me, but had I been present I would have done all I could to have an order published that might have been of some use ; at first it was thought that the order had been published on the recommendation of a medical officer, but this was not the case, the Brigade authorities being alone responsible for publishing an order which they willingly admitted was of no use.

The notes on rabies, given at the commencement of this article, are taken chiefly from a pamphlet issued by the Pasteur Institute Authorities, copies of which should be given to all medical officers prior to their leaving for a tour of service abroad.

EPITOME OF THE REGULATIONS GOVERNING HYGIENE AND SANITATION.

By Captain and Quartermaster G. A. COLLIER.
Royal Army Medical Corps.

Received for publication 13th August, 1925.

"Every officer is responsible that all orders affecting the health of the Army are rigidly carried out by the troops under his command." ("Field Service Regulations," Vol. II of 1920.)

These orders are scattered throughout a number of books of regulations. During the period I was an instructor at the Army School of Hygiene, Aldershot, I had occasion to collect these regulations for teaching purposes.

Acting on the advice of a senior officer I now submit the collection for publication hoping that it may prove of value to officers of the Corps in carrying out their normal duties.

The references do not pretend to be exhaustive, but form a nucleus which can be added to from time to time.

In order to economize space, the regulations are paraphrased, and when dealing with any particular subject it will be advisable to refer to the regulation itself.

Regulations dealing with "Barracks."—The Barrack Synopsis, 1923, is for the information and guidance of chief engineers, commanding royal engineers, and their staffs, and a copy is issued to the A.Q.M.G. and D.D.M.S. of each Command.

Particulars given, as regards military buildings, authorized for various units, and the standard of accommodation and fittings in connexion therewith, are specially applicable to new permanent buildings; but will also form the basis of proposals in large schemes for reappropriation and reconstruction of existing structures, and for new hutted camps and temporary cantonments as may be expedient.

It must, however, be understood that the fact of existing buildings falling short of the recognized standard will not in itself be sufficient to justify a requisition for enlargement, nor for reappropriation with a view to reduction in the numbers for which actually appropriated, without full consideration of the needs of the case; nor as regards quarters will it justify claim by officers and others to an increase of the accommodation to which they are entitled under the King's Regulations.

It is to be regarded as a guide, and not as a hard and fast regulation leaving no discretionary power.

The following extract from Barrack Synopsis gives the internal measurements of barrack rooms referred to in the Regulations for the Medical Services of the Army, paragraph 383.

Station	Height	Floor space (Per individual)	Cubic space (Per individual)	Verandahs, width
Home	10 ft.	60 sq. ft.	600 cub. ft.	—
Gibraltar and Malta	12 ,,	60 ,,	720 ,,	8 ft.
Cyprus; Ceylon, Hill Station; Hong Kong, Peak; Bermuda	12 ,,	70 ,,	840 ,,	8 ,,
North China	11 ,,	70 ,,	770 ,,	8 ,,
Egypt; South China; Mauritius; West Africa, Hill Station; West Indies	13 ,,	80 ,,	1,040 ,,	10 ,,
Soudan; West Africa, Plains; Straits Settlements	14 ,,	100 ,,	1,400 ,,	10 ,,

Notes to above Table.

Note 1.—These measurements have been calculated to ensure that a minimum floor space and cubic air space has been allowed for each man in the barrack room.

Note 2.—Not less than six feet linear wall space should be allowed per man in barrack rooms.

A corresponding table of floor and cubic space for each bed in hospital is given in the Regulations for the Medical Services of the Army, paragraph 30.

It is the duty of the A.D.H. to confer with the R.E. on the sanitary details connected with all schemes originating in the Command relating to building, to water supply, drainage and sewage disposal (Regulations for Army Medical Services, paragraph 375). He is to be present at the tests applied after the completion of any drainage system (Regulations of Army Medical Services, paragraph 376). A medical officer will be a member of the Board assembled to report on sites for buildings or quarters (King's Regulations, paragraph 1372).

Before buildings are handed over A. F. K1251 (a detail of accommodation) is prepared to ensure the correct appropriation, to give the number of fuel units, and other details of measurements, cubic space, and heating apparatus (Regulations S. T. and B. Services, paragraph 390).

After the buildings have been completed by the contractor and handed over the structure is maintained as arranged for in the Regulations for Engineer Services, Part I.

Proposals for reappropriations will be referred to the C.R.E., and the responsible officer of the Hygiene Directorate of the area, or of the Command where no representative exists in the area (King's Regulations, paragraph 1374).

The external wood and iron work is repainted not later than the second year after completion of new buildings and then once in every four years.

Internal colouring of inhabited rooms, two coats of washable distemper once in four years or one coat if necessary on change of occupants.

Internal painting, papering, etc., once in eight years (Regulations for Engineer Services, Part I, paragraph 458).

The use of lead paint which contains more than two per cent of metallic

3

lead is considered dangerous and is not to be used for internal painting (A. C. I., No. 8 of 1925).

Minor repairs are brought to the notice of the D. O. R. E. at his quarterly inspection and shown on A. F. K1308.

Urgent repairs, the postponement of which would cause serious inconvenience to the occupants, are reported to the D. O. R. E. at any time (Regulations for Engineer Services, Part I, paragraph 443).

The officer commanding a unit has authority to employ the R. E. contractor to repair damages chargeable to the unit (Regulations for Engineer Services, Part I, paragraph 480).

The commanding officer's responsibility for the sanitation in barracks is defined in the King's Regulations, paragraph 1335; "The C. O. of a unit, under the direction of superior authority, will be responsible for the care and sanitation of barracks." Paragraph 84 states that "The responsibility for the efficient supervision and for the remedy of defects, rests upon Commanding Officers."

The Deputy Directors of Medical Services make arrangements for the periodical inspection of barracks. Such inspections will be attended by the C. O. of the unit in occupation, a representative of the C. R. E., the Medical Officer, the Quartermaster, as directed in the King's Regulations, paragraph 1358 and Regulations A. M. S., paragraph 361.

The Assistant and Deputy-Assistant Director of Hygiene may visit barracks at any time, but before commencing the inspection will notify the officer commanding the unit concerned. The O. C., if unable to be present in person, will arrange for an officer to accompany the Assistant Director (King's Regulations, paragraph 1359; Regulations, A. M. S., paragraph 370).

The officer in medical charge of effective troops will inspect the whole of barracks, including the married quarters, at least once a month. He should be accompanied by an officer, and the N.C.O. of the regimental sanitary detachment (King's Regulations, paragraph 1,357 and Regulations A. M. S., paragraph 386).

The inspection is made on the lines laid down in Regulations A. M. S., paragraphs 386 to 399 and Appendix I.

His observations are recorded in a sanitary diary (A. B. 39) and submitted to the O. C. concerned who, after recording in it the action taken, will return it to the medical officer.

The peace establishments of 1924-25 authorize the following sanitary personnel: for each regiment of cavalry, 2 men; for each battalion of infantry, 2 men; for each infantry depot, 2 men; for each cavalry depot, 5 men.

The routine sanitary duties to be performed by regimental units are laid down in the Regulations for Engineer Services, Part I, paragraph 520, as directed in the King's Regulations, paragraphs 1362, 1363, and for which a manual, "Instructions in the Care of Barracks," is issued to every unit.

The following services are specially mentioned: catch-pits, surface drains, gullies; cisterns where accessible to the troops; latrines and urinals.

Further instructions are given in the Regulations for S. T. and B. Services, paragraphs 415 and 416.

With regard to drains and gullies, etc., the Regulations A. M. S., paragraph 442, deprecate the use of disinfectants and deodorants, which should not be used except on the advice and under the supervision of a medical officer.

Animals.—The conditions under which animals are allowed in barracks are given in the King's Regulations, paragraph 1364.

Bedding.– The medical officer in charge of effective troops is to satisfy himself that beds and bedding are freely exposed to the air (Regulations A.M.S., paragraph 387).

Blankets issued to a soldier are to be marked with his Army number. The cost of tape and marking ink for this service being charged to the contingent fund (Regulations S. T. and B. Service, paragraph 618, and the Allowance Regulations, paragraph 597).

An extra blanket is issued to every soldier during severe and inclement weather (Regulations S. T. and B. Services, paragraph 614).

Unbleached linen or cotton articles are to be washed before being issued from the barrack store for use by the troops (Regulations S. T. and B. Services, paragraphs 514 and 611).

Bedding which has been exposed to infection must not be returned to barrack or ordnance store until certified by the medical officer that it has been disinfected (Regulations S. T. and B. 631, 656; A.C.I. 823 of 1920; Regulations R.A.O.C. paragraph 351).

Bedding is changed and washed periodically as follows: Blankets, barrack, annually; cases, slip, bolster, fortnightly; sheets, fortnightly; bolsters, coir fibre, when necessary; mattresses, coir fibre, after twelve months in use, when necessary; beds, married soldiers', flock, after three years in use.

Recruits' barracks or receiving rooms: Blankets are to be disinfected before being handed over from one man to another and washed half-yearly; cases (bolsters) and sheets issued clean to each recruit.

A certificate for this exchange and washing of bedding is rendered to the officer in charge of barracks, on A.F. F 704 (Regulations S. T. and B. Services, paragraphs 616, 648, 650 and 653).

Cleaning Articles.—The contingent fund provides cash for the purchase of cleaning articles for the barrack rooms, offices and stores (Allowance Regulations, paragraphs 597, 612, 667).

Disinfectants.—Carbolic acid, chloride of lime, quick lime, creosoli, creosote, izal, formaldehyde, pan oil, are provided by the officer in charge of barracks (Regulations A.M.S., paragraph 426, Regulations S. T. and B. Services, paragraphs 419, 421, and Allowance Regulations, paragraph 616).

Disinfectant solutions of standard strength are given in appendix VI, Regulations A.M.S. They are: creosol emulsion, formaldehyde solution and corrosive sublimate solution. The requisitions for all disinfectants must be countersigned by the medical officer before being sent to the officer in charge of barracks (Regulations S. T. and B. Services, paragraph 419).

Fly Traps.—Fly traps, fly papers, castor oil and rosin (for the preparation of "tanglefoot") are provided in accordance with A.C.I. 360 of 1923.

Fuel.--The allowance of fuel for all purposes is given in the Allowance Regulations, paragraphs 131 and 141. For troops quartered in huts one quarter more coal than the rates laid down in the scale is allowed, paragraph 146. Special temporary issues for airing unoccupied rooms may be approved locally, paragraph 193. For accessories, stores and offices a weekly allowance of 25 lb. of coal is issued for every 1,000 cubic feet occupied. The following accessories are not entitled to fuel: ablution and bathrooms (except in recruiting barracks), canteens, supper-rooms, bars, washhouses, &c.

Hawkers.—A C.O. will restrict the admission of strangers into barracks, and will exclude all persons not of respectable character. King's Regulations, paragraph 1382. Hawkers are only permitted to enter barracks to sell consumable goods if in possession of a pass (Army Form A17), issued by the Assistant Provost Marshal and approved by the Assistant Director of Hygiene. The R.A.F. King's Regulations prohibit hawkers from selling goods within the boundaries of a station.

Latrines and Urinals.—The scale of latrine accommodation in barracks is: W.C. or seat, 6 per cent plus one in each block for sergeants; urinals, 4 per cent plus one in each block for sergeants.

The scale of latrine paper is given in paragraph 651 of the Allowance Regulations, 20 reams per annum for 100 persons.

Night urinals are to be kept locked during the day until evening tattoo (Regulations S. T. and B. Services, appendix XII, paragraph 7).

The regulations for the working of the dry earth closet system in barracks are given in appendix XI of the Barrack Regulations.

The lavatories, latrines and urinals are to be suitably lighted and ventilated (Regulations A.M.S., paragraph 387).

Stables.—Material for limewashing and tar-varnishing in stables is supplied by the Royal Engineer Department to be used as directed in paragraphs 460 and 467, Part I, Regulations for Engineer Services.

The manure pits are to be emptied daily and cleaned, the bottom of the pits to be deodorized with lime (Aldershot Command Standing Orders appendix VII).

Wood-soled shoes are provided, and are to be worn at stables by men of mounted units when quartered in barracks (King's Regulations, paragraph 969).

Barrack Utensils.—Utensils which have become unserviceable are changed periodically (Army Form F766) is submitted to the Expense Store Accountant as directed in paragraph 552, Regulations S. T. and B. Services.

Ventilation and Lighting.—The officer in medical charge of effective troops will satisfy himself that every barrack, guardroom and detention room is suitably lighted and provided with sufficient means of ventilation (Regulations A.M.S.. paragraph 387).

Windows of barrack rooms are to be kept wide open "weather permitting," and the upper sashes are to be opened to the extent of at least one foot during the night (King's Regulations, paragraph 1361).

Window cleaning is usually done by the troops, but when owing to the windows being too high and dangerous this course is not possible, they will be cleaned periodically under contract (Regulations S. T. and B. Services, paragraph 401).

Water Supply.—The medical officer inspecting barracks is directed to satisfy himself that the amount, quality and arrangements for the distribution of drinking water are satisfactory (Regulations A.M.S. paragraph 393).

Water is not to be kept in the men's water bottles when the bottles are not in use (King's Regulations, paragraph 971).

Twenty gallons a day for each officer, man, woman and horse, and ten gallons a day for each child is a liberal supply of water for all purposes in barracks.

For the personnel and patients in military hospitals, fifty gallons for each day may be taken as a guide to the quantity of water required (King's Regulations, paragraph 1380).

Water tanks used by the troops will be periodically cleaned out by the Royal Engineers, and cisterns, where accessible, by the troops themselves (King's Regulations, paragraph 1362).

Workshops.—The Barrack Synopsis provides for 40 square feet of floor space and 400 cubic feet of air space as a minimum working space for each individual employed in a workshop.

The shops need to be regularly cleaned and carefully ventilated.

The Regulations for the Army Ordnance Corps make special arrangements for the men employed in painter's and tinsmith's shops :—

Conveniences for washing, nail brushes and towels, are provided; every man must wash his hands and face before leaving work; overalls must be worn ; food is not to be eaten in the shops ; tobacco chewing is forbidden ; toothbrushes are supplied and renewed as necessary.

For mixers and grinders of paint materials, a sanitary drink is provided. This preparation is supplied from the dispensary of the local military hospital and usually contains sulphate of magnesia, dilute sulphuric acid and water.

Hutments.—Where earth closets exist, the supply of dry earth and the removal of night soil is arranged by contract. Arrangements are to be made to supervise the contractor's removal arrangements (Regulations, S. T. and B. Services, A.C.I. 253 of 1922).

Extracts from the R.A.F. King's Regulations.—The sanitary detachment act as sanitary police, paragraph 1836.

Medical officers are to advise Commanding Officers on the precautions to be taken when lead arsenate or other poisonous substances are used, paragraph 1485 (5).

Systematic efforts are to be made for the destruction of rats in barracks twice yearly, during March and September, in co-operation with the civil authorities through the county rat officer, paragraph 825.

Detention Rooms, Guard Room and Cells.—Watch coats are held on charge in the guard room between November 1 and April 1, for sentries to wear during very inclement weather (King's Regulations, paragraph 1303, and Clothing Regulations, page 109, referring to the issue being subject to War Office approval).

The Officer Commanding a station will ascertain, before permitting soldiers to be committed to a detention barrack, or barrack detention room, that it has been certified under War Office authority to be of such a size, ventilated, warmed and fitted up as may be necessary for the health of the occupants (King's Regulations, paragraph 714).

Before being committed to a detention barrack or barrack detention room, a soldier is to be examined by a medical officer, who will furnish a certificate as to his state of health and report any disability likely to interfere with the punishment awarded (King's Regulations, paragraphs 680, 717).

Each occupant of branch detention barracks and barrack detention rooms is to be visited daily by an orderly officer and also by a medical officer (King's Regulations, paragraph 719).

A soldier in close arrest will be allowed his bedding if his arrest exceeds two days.

In severe weather a soldier in close arrest may be allowed such bedding as may be necessary.

A soldier in close arrest is to take sufficient exercise, under supervision, for the preservation of his health (King's Regulations, paragraphs 536, 712).

A man placed in close arrest for drunkenness is not to be deprived of his boots when the weather is cold and he is likely to suffer in consequence. He is to be visited and his condition ascertained at least every two hours by a N.C.O. of the guard and an escort (King's Regulations, paragraph 534).

Institutes and Messes.—Officers' mess servants are not to sleep in the servants' rooms attached to officers' quarters, class 12 to 14 (King's Regulations, paragraph 1395).

Particulars regarding the management of institutes are contained in the rules for the conduct of garrison and regimental institutes (King's Regulations, paragraph 1631).

The medical officer will frequently inspect the method of sterilizing drinking vessels in all the canteens, etc. (Regulations, A.M.S., paragraph 392, A.C.I. 397 of 1918).

The ordinary precautions taken in civilian shops are to be taken in the N.A.A.F.I. for the protection of foodstuffs (Letter C.R.A.C. 2/81422/6Q).

Instructions for the management of barbers' shops in barracks were issued with Aldershot Command Orders, September 20, 1924.

Extracts from the R.A.F. King's Regulations.—The Commanding Officer and the medical officer at a station will frequently visit all the institute premises, paragraphs 1485 (3), 1759.

It is the duty of the orderly officer to visit all the institute premises daily, paragraph 1758 (n).

The sale of poisons is prohibited. The medical officer may approve of the sale of harmless drugs and medicines, paragraph 1764.

Kitchens and Dining Halls.—An orderly officer will inspect the kitchens and cooking apparatus daily. The orderly officer will superintend the issue of meals from the cookhouse to the dining room. He will be present in the dining room at the breakfast, dinner and evening meal hours to see that the meals are properly prepared, and that there is no cause for complaints. The food refuse must be stored in covered sanitary bins supplied by the purchaser (King's Regulations, paragraph 1485).

These receptacles are to be scrubbed out with hot water twice a week (A.C.S.O./269).

The officer in medical charge of effective troops is to ascertain that the kitchens and dining rooms are suitably lighted and ventilated, and that the amount, cooking, variety, preparation and storage of food are satisfactory (Regulations A.M.S., paragraphs 387, 391).

An issue of fuel at the scale laid down for accessories, Allowance Regulations, paragraph 138, has recently been authorized for warming dining rooms (War Office Authority, Number 53/General/3143—Q.M.G. 6 14.2.25).

The manual of military cooking and dietary gives further detail regarding the supervision of the kitchen and dining halls.

Extract from the R.A.F. King's Regulations.—The Commanding Officer of a station will see that the cookhouses and all utensils therein are kept scrupulously clean. Cooks are not to be permitted to sleep, or keep their clothes, in the cookhouses (paragraph 1733).

Married Families and Quarters.—The size and type of quarter to be allotted to a married family depends solely on the number, age and sex of the children (King's Regulations, paragraph 1404).

The married quarters are inspected at least once a month as directed in King's Regulations, paragraph 1357, and Regulations A.M.S., paragraph 386.

The ventilation, lighting and condition of the walls and ceilings are to be noted (Regulations A.M.S., paragraph 387).

Arrangements should be made for the collection and removal of refuse as directed in the Regulations S. T. and B. Services, paragraph 412.

When an officer or soldier employs a civil medical practitioner to attend upon himself or his family he will at once report the circumstance (forwarding a certificate as to the nature of the illness) for the information of the Commanding Officer and the officer in medical charge of effective troops.

The medical officer is authorized to visit any case of sickness occurring in barracks to enable him to take the necessary sanitary precautions (King's Regulations, paragraph 1431).

When a case of infectious disease is diagnosed amongst troops or married families a report on Army Form A35 is submitted to Command Headquarters and to the officer in medical charge of effective troops or military families concerned (Regulations A.M.S., paragraph 416).

The state of vaccination and revaccination of women and children is to be ascertained by the officers in charge of families, once a year during January (Regulations A.M.S., paragraph 403).

Officers' families are to be given the opportunity of similar protection (Regulations A.M.S., paragraph 402).

A mother and child welfare scheme should be arranged in every Command for the benefit and medical care of soldiers' wives and their children. Army Form C320 has been issued in which the medical officer enters the results of his examination of children up to the age of 5 years. Detailed instructions are printed on the Army Form C320.

The concessions granted to mother and child welfare centres have been published in A.C.I. 536 of 1924.

Washing of Soldiers' Clothing.—The arrangements for washing soldiers' clothing are described in Army Council Instruction 205 of 1922.

Washing and mangling in quarters is forbidden (A.C.S.O., paragraph 315).

Army Schools.—The Assistant Director of Hygiene supervises all matters relating to the welfare of the school children (Regulations A.M.S., paragraph 377).

The officer in medical charge of effective troops is responsible for the medical inspection of all the children, and for the completion of the schedule of medical inspection (A.F. C319) which is prepared and duly completed for each child, as described in paragraph 13, Chapter IX, Educational Training, 1923. He is to visit frequently the school when the children are present to ascertain that their studies are pursued under hygienic conditions (Regulations A.M.S., paragraph 394).

Children of a family in which a case of infectious or contagious disease occurs are to be exempt from attending school whilst there is a risk of spreading infection. The school should be closed on the outbreak of an epidemic of infectious disease (Regulations A.M.S., paragraph 422).

Army schools are cleaned under the direction of the R.E. during the Christmas and summer vacations; desks and woodwork scrubbed with 2½ per cent. creosol solution. The windows are left open throughout the whole vacation.

Annually, lime-whited walls will be thoroughly scraped, brushed and relime-whited.

Every five years the walls of the schoolrooms will be redistempered, ceilings rewhitened, and paintwork repainted, as may be deemed necessary by the R.E. (Regulations A.M.S., paragraph 444).

Whenever it is considered necessary to scrape walls and redecorate after disinfection, following infection of the premises, a certificate from the medical officer is required by the R.E. to support the bill for the work (Regulations for Engineer Services, part I, paragraph 469.

Further instructions regarding the procedure in Army schools are given in "Educational Training," 1923.

Infection and Disinfection.—The regulations regarding action to be taken when a case of infectious disease occurs in barracks are given in Regulations A.M.S., paragraphs 416 to 433 and appendix II.

The outstanding points are: (*a*) The disinfection is carried out by medical authority. (*b*) The minimum measures to be taken are stated in appendix II. (*c*) Disinfection of bedding, etc. (paragraphs 435, 436). (*d*) Disinfection by formaldehyde (paragraph 427). (*e*) Disinfection of ambulance or other vehicle (paragraph 441). (*f*) Destruction of infected articles (paragraph 443). (*g*) The method of effecting isolation (paragraph 421). (*h*) Notification when wives or children of officers or soldiers, under treatment for tubercle of lung, are moved from one station to another (paragraph 497). (*i*) Disinfection of quarters necessitating scraping of walls, whitewashing, distempering, or repapering (paragraph 434).

In the case of epidemic disease every care will be taken to ensure that articles likely to convey infection are not returned to barrack expense or ordnance stores before being disinfected (King's Regulations, paragraph 1360). The Regulations R.A.O.C. (paragraphs 351 and 352) also refer to the necessity for the disinfection of articles exposed to infection before return to store.

Health of N.C.O.'s and Men.—Recruits are medically inspected before joining the Service, and vaccinated immediately afterwards (Regulations A.M.S., appendix XIb, paragraphs 538 and 400).

During their physical training they are under constant medical supervision (King's Regulations, paragraphs 745, 746; Regulations A.M.S., paragraphs 379, 459, 547).

The officer in medical charge of effective troops will satisfy himself at monthly inspections as to their personal hygiene. The regimental chiropodist should attend these inspections and all feet inspections by unit officers (Regulations A.M.S., paragraph 389). The training of chiropodists is arranged in King's Regulations, paragraph 836.

Individuals are further medically inspected (*a*) on joining a unit, whether from abroad, from another unit, or on return from furlough (Regulations A.M.S. paragraph 390); (*b*) On the day of departure from a station (King's Regulations, paragraph 1094); (*c*) Preliminary inspection prior to embarkation (King's Regulations, paragraph 1092); (*d*) Before trial by court-martial (King's Regulations, paragraph 641); (*e*) Before undergoing detention (King's Regulations, paragraph 717).

Officers commanding are to pay particular attention to the preservation of the health of the troops (King's Regulations, paragraph 84).

The company commander is responsible that attention is paid to the men's cleanliness (King's Regulations, paragraph 96).

In cold weather overalls may be worn over, and in warm weather without, the Service dress (King's Regulations, paragraph 968).

The hair of the head is to be kept short (King's Regulations, paragraph 948).

The attention of all ranks is to be drawn to the necessity for taking the greatest care of the teeth (Regulations A.M.S., paragraph 588).

Glasses may be worn by all ranks, on or off duty (King's Regulations, paragraph 955). Spectacles are supplied to serving soldiers under the provisions of paragraph 324 and appendix XX of the Regulations A.M.S.

Swimming will be taught at all stations where facilities exist. Bathing parades will be formed at the discretion of the Commanding Officer for the purpose of instruction.

Small picquets of expert swimmers will be told off daily during the bathing season to attend the bathing places to prevent accidents (King's Regulations, paragraphs 760, 761).

Every officer and soldier should understand the principles of hygiene and sanitation by means of which health is maintained and disease prevented. He should also be acquainted with the component parts of the "first field-dressing," and with the manner of applying it to a wound.

General officers will, therefore, arrange for the instruction of all ranks in these subjects by means of four annual lectures and demonstrations during the winter months by medical officers. The attendance at these lectures of all officers and men present with their units and not prevented by other duties is compulsory in the case of units other than medical units (King's Regulations, paragraph 837).

The Assistant Director of Hygiene arranges courses of instruction as may be necessary within the command for the diffusion of the knowledge of practical hygiene amongst officers and men (Regulations A.M.S., 378).

The officer in medical charge of effective troops will deliver lectures to officers and men on the use of the first field-dressing, hygiene, sanitation and venereal disease (Regulations A.M.S., paragraph 460).

A synopsis of lectures on these subjects is given in appendix XXI of the Regulations A.M.S.

Further arrangements for instruction in Military Hygiene are given in the pamphlet " Courses of Instruction," issued with A.C.I., 356 of 1925.

A course of six lectures in this subject, and one lantern demonstration will be given in each term to the cadets of the senior division at the Royal Military Academy and the Royal Military College.

A.C.I., No. 665 of 1924, arranged for the instruction of the officers and cadet N.C.O.'s of medical units, senior division O.T.C. at the Army School of Hygiene.

War Office approval has been given for the A.D.H. or D.A.D.H. of each command to lecture to the officers of the junior division O.T.C during the period the division is in camp.

The name of every soldier reporting himself sick will be entered on a sick report, A.F. B256, which will be prepared in duplicate and sent with the man to the medical inspection room (King's Regulations, paragraph 1421).

Men suffering from venereal disease are to report sick at once (King's Regulations, paragraph 520).

Every patient suffering from venereal disease will, on admission to hospital, be given a card (A.F. I1242 or 1243) containing instructions regarding his disease (Regulations A.M.S., paragraph 60).

A soldier convicted of an offence under the Army Act admitted to hospital on account of any illness, certified by a medical officer as having been caused by an offence, i.e., venereal disease, drunkenness, delirium tremens, or the effect of drugs, forfeits the whole of his pay whilst in hospital (King's Regulations, paragraph 565). A.F. O1644 is sent by the M.O. to the C.O. of the individual concerned. (Regulations A.M.S., paragraph 69).

Army Forms.—In amplification of the various regulations on this subject a number of Army forms have been published for the information and guidance of the troops. The following are important :—

A.F. B51 : Health memoranda for soldiers.

A.F. B51A : Health memoranda for women and children proceeding abroad.

Pamphlet: "Elementary Physiology and its relation to Hygiene." 1919.

A.F. B150 : Prohibition of spitting.

A.F. G1022 : Identification bedding tally.

A.F. K1284 : Instructions for cleaning latrines and urinals.

Instructions for the recovery of the apparently drowned. The King's Regulations direct that a copy of these instructions, printed by the Royal National Lifeboat Institution or the Royal Life Saving Society, will be posted up in every hospital and barrack.

Fly posters, illustrating the danger to health from flies, are obtainable from the A.D.H. in commands for exhibition in the men's barrack rooms.

A CORRESPONDENCE CIRCLE.

XI.

Some Pros and Cons of Chemical Warfare.

A Reply by Major H. S. Blackmore, O.B.E.
Royal Army Medical Corps.

I was much interested in the article which appeared under the above title in the "Circle" of the May, 1925, issue of our Journal. As one who is supposed to be conversant with the situation, I beg to submit the following reply, in the hope that others may be stimulated to take up the discussion of this important subject.

The first point I would like to consider is contained in the sentence "or whether it (chemical warfare) may not be found wanting in effectiveness or superseded by some other method of destruction." Does not this sentence contain a *suggestio falsi?* F. S. Regs., Vol. II, par. 2 reads: "The ultimate military aim in war is the destruction of the enemy's main forces on the battlefield"; but this aim can be attained without actual destruction of life, and troops can be rendered ineffective by affecting either the individuals or their arms or their means of transport. One may even go further than this and say, that the attainment of the military objective may actually be made a more likely consummation if the enemy is embarrassed with large numbers of casualties, than if the same number of men are killed outright. Casualties, using the word to designate men who are sufficiently "knocked out" to prevent their fighting but who are not killed, require feeding, transporting, nursing and doctoring, and therefore produce a very definite and continuous drain upon supply, transport and man-power. The crux of the situation is the period of time over which the man remains a casualty. Whether the destruction of the enemy's forces on the battlefield will remain the ultimate aim of war in the future is at least open to debate, for such methods as submarine blockade or the attack on and paralysing of the centres of government may destroy the "national determination to conquer" (F. S. R., Vol. II, pars. 1, 2). My first point then is that chemical warfare holds the possibility of producing large, very large numbers of casualties, with all the secondary effects that this implies. It must not be forgotten that from the General Staff point of view casualties are just as effective when they are relative as when they are absolute. What I mean is, if the arrival of a body of troops at a given place at a given time is prevented, the effect upon the calculations of the General Staff may well be the same as if those troops were actual casualties, and this is true of all cases, even if merely the result of extra strain thrown on those troops from their being compelled to wear their respirators.

The impression of chemical warfare derived from articles in the press must necessarily be misleading. This natural tendency is exaggerated by the fact that when this weapon was first used by the Germans the press was used for propaganda purposes, the "devilishness" being stressed for the double purpose of enhancing the apparent devotion and courage of our own troops and emphasizing the brutality of our enemy, thus rousing a storm of national feeling calculated to counteract the seriousness of the situation, stimulate recruiting, and ensure a whole-hearted response to appeals for any special measure of effort required. Later on when we, and our allies, adopted chemical warfare the whole subject was left severely alone in the press and the original distorted mental picture remained. At the present time the subject is not ventilated by any accurate inspired articles, for reasons of policy which need not concern us here. The fact remains, as claimed in the article under consideration, that the impressions to be gained from the press are misleading both in statement and suggestion. But there is one factor of real importance which is occasionally referred to, and upon which a book has been written by Lefebure under the somewhat curious title of "The Riddle of the Rhine." This factor is the very close association between the dye industry and chemical warfare. Space does not permit of any full discussion of this matter here and I would suggest the reading of Lefebure's book. The whole point of the moral is surprise, and this factor of surprise is dependent, not only on the problematical discovery of new compounds, but also upon the comparative ease of production of war-useful chemicals, toxic and otherwise. This ease of production means that they would be available sooner and in greater bulk, a matter of great importance and referred to later when considering strategy and tactics. From the General Staff point of view the importance of this "dye-industry-factor" does not depend as much as might at first glance be expected upon the possible discovery of new substances because, although this bogey is naturally ever present in one's mind, the whole trend of experience has been to show that substances which are effective for their purpose fall naturally into one or other of the already well defined groups of classification according to physiological action. For each of these groups we have our definite plan of action, whether for protection or treatment. The routine may be more or it may be less effective, but at least we have a routine.

If we look at the matter from the strategical and tactical side, rather than from the somewhat individualistic physiological viewpoint, we are at once struck by the possibly paramount importance of *either* a new substance *or* of the rapid availability of large quantities of the old substances. One of the first lessons to be learnt in the use, or abuse, of chemical warfare is the vital necessity of mass of material, and that anything which could be called "playing with the weapon" is worse than useless. This was one of the many cardinal mistakes of the Germans.

To summarize, and in conclusion, I would suggest that chemical

warfare stands in no likelihood of being limited merely as the result of failure to produce new substances. The old substances, even as used in the late war, produced results which were, on the whole, more than sufficient to justify its retention as an effective unit of our armamentarium. I am quite willing to allow that as a casualty producer it was not as effective as "many diseases of comparatively low incidence," but this comparison is unsound, for one agent is loosed at will and the other is not.

There is little likelihood of limitations being imposed at present by the implied necessity for new compounds. Further study of the special strategy and tactics of chemical warfare, and consideration of ways and means for its employment by other arms of the Services, notably aeroplanes and tanks, discloses fields which, even if thought of during the late war, were never cultivated. Increasing understanding of its potentialities; improvement in co-operation between the various arms of the Services; intelligent comprehension by the staff of the fundamentals required for the development of its full powers . . . these are the lines upon which immediate advance can be, and is being made. These are the factors which are radically changing the whole picture, and which will produce a weapon whose efficacy will mean a rude awakening for anyone who allows himself to slumber in complacent contemplation of its past history.

The fact that chemical warfare is a powerful producer of casualties is one which is of very great moment to us. All casualties in the sense in which we are using the word are the direct concern of the Medical Service. A proper and full use of chemical weapons may be expected to increase the number of these casualties in two ways, firstly, from the fact that the ratio of casualties to killed will be raised; secondly, by the fact that larger actual numbers of men will be affected, and in this connexion it must not be forgotten that the old conceptions of time relations, on which our problems of evacuation have been worked out and legislated for, will almost certainly be radically altered. Against this must be set off the protection which may be hoped for from the extensive use of smoke screens, and the fact that the average length of stay in hospital is likely to be lowered. These points raise questions of vital importance to the administrative side of our Service. When one remembers that there are many professional considerations—such as methods of prevention, mitigation by early treatment, whether surgery can be carried on in an atmosphere of gas or on a gassed patient, diminishing hospitalization and its consequent neurasthenia, etc.,—to be added to the list, it is, I think, sufficiently obvious that the whole subject of chemical warfare calls for earnest thought by all branches of the Medical Service, and by all individual members of our Corps.

If chemical warfare is used to the limit of its possibilities we must bear in mind that "the daily round, the common task" may have to be done in a toxic atmosphere for long periods at a time, which will necessitate the wearing of the respirator by all individuals, *including our patients*; that

individuals contaminated by mustard gas are comparable to cases of infectious disease and carry with them obligations regarding disinfection, change of clothing, etc. These, and many other points, require consideration. If the Medical Service breaks down the cost in man-power is heavy, and the effect upon *moral* is almost as bad as a military reverse. Let each of us do our best, by thought and the free interchange of ideas, to prepare our Corps to deal with the situations which can easily be visualized as highly likely to occur.

[*Note.*—I have to thank Major H. S. Blackmore for the above. His criticism is valuable, and he presents the subject of Chemical Warfare treated in its broader aspects. It is this type of article that the Circle wants, and it is this type of higher thought on war problems of the future that the Circle hopes to develop. It could do with many more articles of this calibre, and looks forward to receiving them from the many readers who have kindly expressed themselves in sympathy with the objectives of the Circle.—M. B. H. R.]

Editorial.

HEALTH OF THE ARMY.

THE report on the health of the Army for the year 1923 has been sent to the press within five months of its predecessor, and the Director-General states that the report for 1924 is almost completed and will be issued shortly. We congratulate all concerned on the special effort that has been made to bring out these reports at an early date, as much of their interest is lost when a period of some two years intervenes between the issue of the volumes. It would be a great advantage if the report on the health of the Army could see the light in the year immediately following the one under review; but as much of the material comes from India and commands abroad, we realize that this is a difficult matter, especially just now when administrative and other staffs may again be reduced.

The statistical tables contained in these reports will always be a mine of information to the administrator, and as illustrating this point we may mention that during the war the tables in the reports prior to 1917, showing the prevalence of sore throat and respiratory diseases on board ship, enabled the medical branch to secure eventually an increase in floor and cubic space on transports, with the result that the admissions for tonsillitis have been reduced from 32·5 per 1,000 in 1913 to 7·3 in 1923. To the research worker the reports are invaluable; their perusal cannot fail to suggest subjects for inquiry; and it is from this point of view that early publication assumes great importance.

We are glad to see that in the report for the year 1923 information concerning the most important diseases has been extracted from the various command reports, and under the heading of each disease the experiences both at home and abroad are collected together. This arrangement makes the report extremely interesting, and it will be a great help to an officer anxious to know the main facts in relation to any disease in which he is interested. Instead of having to hunt through the whole report he will now find the latest information prepared for him in a very readable manner. Under the heading Special Departments are given details of the organization, courses of study, research work, etc., in connection with medicine, surgery and pathology; dental treatment and medical examination of recruits are also dealt with in similar sections. This is a much better arrangement than that in the report for 1922 where, for instance, under the heading Hygiene we find in addition to subjects properly pertaining to health measures, descriptions of malaria, diseases of the digestive system (excluding tonsillitis), local injuries, diseases of areolar tissue, influenza, tonsillitis, etc. It is true that these diseases are mainly discussed

from the preventive side, but we think the arrangement in the report for 1923 is preferable.

The improvement in the general health of the Army is maintained; there were 544 admissions to hospital per 1,000 of strength in 1923, in place of 699 in 1922. The principal causes of admission to hospital are mentioned; of these malaria, sand-fly fever, inflammation of tonsils and dysentery show an increase in the admission ratio compared with the previous year, while influenza, venereal disease, scabies and diseases of the digestive system show a decrease. The average sick time to each soldier was 10·2 days, and judged by this average the commands with the highest ratio of inefficiency were: Iraq 34·3 days, West Africa 24·76 days, and Malta 21·46 days; while those with the lowest ratio were, Mauritius 3·38 days, Bermuda 6·25 days, at home 8·0 days.

The number of invalids discharged from the Army was 14·5 per 1,000 of strength compared with 7·88 in 1913. The diseases mainly responsible for this high invaliding were inflammation of the middle ear, disordered action of the heart, flat-foot and neurasthenia. The principal causes of inefficiency on account of sickness in hospital were gonorrhœa, malaria, inflammation of areolar tissue, inflammation of tonsils and fractures.

The diseases which are of the greatest importance from the economical point of view, both to the State as regards inefficiency and subsequent pensions, and to the individual, are discussed in the order adopted in the various statistical tables.

Diphtheria takes the first place, and there is an interesting account of an outbreak among the Guards stationed in London and at Pirbright; the source of the outbreak was a convalescent carrier who was eventually discovered by the application of the Schick test. The immunization of all susceptible men was carried out with toxin and antitoxin mixture.

Dysentery shows a definite increase in 1923, mainly traceable to Iraq, and in a less degree to India. In Iraq 180 cases out of 297 were amœbic, in Turkey 70 per cent of the cases were bacillary. The prevailing type in India is not mentioned, but in the report for 1922 it is stated that of 573 cases 479 were protozoal in origin. The majority of the cases invalided home were amœbic and the majority of the admissions at the home stations were of this type.

The enteric group of diseases was a very small factor in causing disability amongst the troops, which is attributed to the fact that ninety per cent of the troops serving overseas are vaccinated against the disease.

Of all diseases malaria caused the greatest number of admissions; the ratio this year represents a forty-four per cent increase on 1913. This is accounted for by our post-war commitments in the East and mobilization on the Waziristan frontier. Apart from preventive measures it is hoped to reduce inefficiency by supervision of convalescents and carrying out anti-relapse treatment. It is stated that the judicious use of arsenic alternately with quinine is still the most effective method of preventing relapses.

Sand-fly fever is a serious source of sickness amongst troops in the East; the infection breaks down the soldier's resistance and makes him more susceptible to protozoal parasites. The incidence of the disease has more than doubled since 1913. The preventive measures indicated by the Royal Air Force Commission have been applied as far as possible. Many attempts have been made to isolate a causal organism, but so far without any result, and there is as yet no means by which a clinical diagnosis can be confirmed in the laboratory.

From 1904 to 1913 there was a steady fall in the admission rate for tuberculosis; in 1921 the rate rose again, but in 1923 the lost ground had been recovered. The variation during the whole of the period since 1904 has been in pulmonary tuberculosis, the figures for other tuberculosis varying only 1 in 10,000. Recruits in the post-war period were not of the same standard as pre-war, rejections for tuberculosis were more numerous, and it was only the vigilance of recruiting officers that prevented a very considerable increase in its incidence in the Army. An analysis of the incidence of tuberculosis by age and service shows that 64 per cent of the cases were between the ages of 18 and 25, and 53 per cent were in the first five years of service. It is therefore hoped that by still more careful recruiting it may be possible to eliminate a proportion of these men from the Army.

The ratio of admissions for venereal disease has fallen both in commands at home and commands abroad, and also in India. The continual decrease is attributed to the provision of wholesome indoor and outdoor exercise for young soldiers, the increase in temperance, improved treatment, spread of information regarding the disease and the provision of preventive outfits and facilities for disinfection. Modern preventive and curative treatment has been more successful with syphilis than with gonorrhœa, and improvements in the methods of combating the latter disease are very necessary. It is to be hoped that the research work on new forms of treatment of gonorrhœa, referred to in this report, will expedite the recovery of these cases and by diminishing the stay in hospital be the means of considerable saving to the State. Venereal diseases are now treated in special sections of the general military hospitals. The Military Hospital at Rochester Row was closed in July, 1923, and the clinic established in the Royal Herbert Hospital, Woolwich.

Middle-ear disease heads the list of diseases which cause the greatest amount of invaliding and led to the loss of nearly half a regiment of men. Many of the cases were sequelæ of influenza or a recrudescence of old conditions which escaped detection on enlistment, although in 1923 some 1,452 men were rejected for this cause on examination for enlistment, and 374 were disposed of with less than six months' service. A more thorough examination on enlistment and improved methods of treatment should cause a diminution in the loss from middle-ear disease.

Disordered action of the heart, which ranks fourth on the list of diseases causing invaliding, was responsible for 847 admissions and 173 invalids.

These figures are higher than those for 1913, but show a definite improvement on those for 1921 and 1922. A War Office committee which has been investigating the subject has come to the conclusion that cases of disordered action of the heart can be placed in two main groups: (1) those in which there is evidence that the disability existed before enlistment, and (2) those in which it has developed after enlistment. The first group provided a large proportion of the cases. The committee have been making experiments in order to find a simple form of exercise tolerance test which could readily be put into operation in the recruiting office and would eliminate the first group. They have, however, decided that further experiments must be made, as they are "not in a position to lay down any hard and fast rules for standard tests for disordered action of the heart, for fear of a too literal interpretation leading to the exclusion of satisfactory recruits." A definite cause could be assigned to most of the cases in the second group, and the committee are now considering reports from medical specialists on the ætiology and treatment of these cases.

Tonsillitis was responsible for 5,566 admissions to hospital and a ratio of 29·0 per 1,000. In 1913 the corresponding figures were 4,774 and 22·7. It ranks high as a cause of inefficiency and appears to have a universal distribution, irrespective of climate. The spread of the disease is favoured by proximity, dust and bad ventilation, but there is still some doubt as to its exact ætiology.

On the Rhine four distinct types of cases were noted, each of which had a predominating organism. Simple enlargement of the tonsils was associated with streptococci; multiple patches of exudate and marked pyrexia with staphylococci; deep ulceration and little local and constitutional disturbance with *Bacillus fusiformis*; peritonsillar abscess with staphylococci and streptococci.

Jaundice accounted for 1,380 admissions, a ratio of 2·06 per 1,000. The cases were arranged in three groups: (1) simple catarrhal, (2) epidemic, and (3) arsenical. Simple catarrhal jaundice was usually seen at home, but in the East the epidemic type prevailed. Special attention was directed to this type, but all attempts to find a causal organism, either by direct observation on the blood or by inoculation into guinea-pigs, proved negative. Thirty-eight cases of jaundice following anti-syphilitic treatment were reported from the Rhine. As a result of a thorough investigation it was agreed that the jaundice more frequently followed the administration of neo-kharsivan than other arsenical compounds, that it was not caused by an overdose of drugs, but appeared to be due to some personal susceptibility, possibly arising from free indulgence in alcoholic liquors. Intramine was found to have no effect in preventing arsenical jaundice. The use of neo-kharsivan has been given up.

Flat-foot causes considerable loss of man-power to the Army: 144 men were invalided from this cause during the year; and 1,611 candidates for enlistment were rejected by the recruiting officers, and 194 were rejected as

unfit within six months of enlistment. The great difficulty with this disability is that it is not always the man with obvious loss of the longitudinal arch of the foot who breaks down under training, but youths who have actually a high arched instep but have never been accustomed to much standing or weight carrying. Treatment necessitates the provision of special boots, and it is impossible to ensure that the man will wear them for all purposes.

Fractures rank fifth amongst the conditions causing the greatest amount of inefficiency; there were 1,566 admissions to hospital from this cause in 1923. This type of injury is very likely to occur amongst men of the soldier's age, and is associated with games and training which form part of military life. A high standard of functional recovery is necessary if a man is to remain in the Army, and the fact that only 3·3 per cent of the fracture cases were invalided speaks highly for the methods of treatment in the Army. This success has been attained by all officers being specially trained in methods of splinting, by attention paid to massage and electro-therapeutic measures, and by operative treatment.

During the year there were 704 admissions for tumours and cysts, of which only about twenty-six proved to be malignant. Great attention has been paid to the study of cellular pathology in the Royal Army Medical College and, thanks to the training given by the professor of pathology, there are now many officers who can be trusted to give a sound opinion on any tissue submitted to them, a matter of the first importance to the patient in view of the necessity for early treatment in cases of malignant disease.

A study of the tables giving the admissions to hospital of the wives and children of warrant officers, non-commissioned officers and men shows that medical officers of the Army have considerable opportunity of gaining experience of the diseases of women and children. In several of the large stations there are maternity hospitals in which excellent work is done. In addition, the specialist officers conduct welfare centres where great good is being done for both mothers and children.

The second section of the report is devoted to the Special Departments. Under Medicine some of the questions at present interesting the specialists in medicine are dealt with. It is stated that the treatment of *relapsing amœbic dysentery* has been greatly improved upon by the introduction of *stovarsol*; a course of four-grain tablets being given three times a day for a month in chronic cases. Its value in acute cases has also been proved.

Sprue has been successfully treated by a dietary, the basis of which is milk supplemented by vitamin-containing foods and preparations such as oranges, lemons and marmite. Calcium and parathyroid treatment has not been very encouraging.

Cases of *oriental sore* with multiple sores, or sores on the face, have been treated by intravenous injections of antimony tartrate, and eight days after the first injection the nodules had entirely disappeared. The treatment of

kidney disease and of diabetes by insulin is now controlled by blood tests. The diagnosis of nervous diseases constitutes an important part of the medical specialists' work.

Surgery for the first time finds a special place in the report on the health of the Army. It is pointed out that in the South African war the prevention and treatment of disease was of greater importance than surgery; in the Great War, on the other hand, surgery was of overwhelming importance. Unfortunately, most of the officers of the corps had to be employed on administrative work, and the surgical work was mainly carried out by civilian surgeons, so that in the years following the war there were not many Royal Army Medical Corps officers who had surgical experience. Special efforts have been made to train specialists in surgery, and a high standard of specialism, based on the training for the F.R.C.S. England, has now been created. Operating theatres are being brought up to modern requirements, and in the chief military hospitals excellent team work now exists. New schedules for the surgical equipment of field units have been drawn up by the consulting surgeon and the professor of military surgery, and special operating outfits have been supplied to Indian transports.

In the Directorate of Hygiene strenuous endeavours are being made to provide accommodation in barracks up to modern standards. Mosquito surveys and schemes for the destruction of mosquitoes have been undertaken in Aldershot, Gosport, Bermuda, Ceylon, Egypt and Jamaica.

Under the direction of the Army Hygiene Advisory Committee an investigation on the load to be carried by the soldier has been carried out, and the opinion previously held that a soldier should not carry more than one-third of his body weight has been confirmed. Major Harold has carried out an important investigation at the Army School of Hygiene, Aldershot, on the sterilization of water by ammonia and a solution of chlorine gas, and its practical use in the field was investigated at the late manœuvres. Important investigations are also being made at the Royal Army Medical College hygiene laboratory, where also, owing to the closure of command hygiene laboratories for financial reasons, routine work for the various commands has been carried out.

Under the instructions from the Directorate of Pathology research work and investigation on the blood of X-ray workers is still in progress. A bacteriological investigation on the flora of tonsillitis has been carried out, but the results so far are inconclusive, no predominating organism having been found at any particular season of the year. Experiments have also been made on the provision of a complement fixation test for the diagnosis of rabies. The sera of patients taken fourteen days after the completion of antirabies treatment was employed for antibody, but even when large quantities of serum were used no appreciable fixation of complement took place. In the pathological department at the Royal Army Medical College vaccines and diagnostic sera have been prepared, and the saving effected by their manufacture in the college, instead of purchase in

the open market, is estimated at £12,650. The professor of pathology acts as a consultant in any problem connected with pathology that may arise in the diagnosis of medical or surgical disease. Valuable research work has been carried out at the college during 1923, in connection with prophylactic vaccination against dysentery, the provision of stable diagnostic sera, and cellular pathology.

The standard of dental treatment has been systematically improved during the year, and the efforts of dental officers have been mainly directed towards the complete initial treatment of recruits in depots and the continuation treatment of young soldiers. During the year 52,446 men were treated, the conservation of useful teeth and the avoidance where possible of artificial substitutes being the aim of all dental officers.

The number of recruits examined in 1922-23 was 58,709 against 77,498 in 1921-22. The ratio per 1,000 rejected on enlistment was practically the same in the two periods, but the ratio discharged within six months of enlistment rose from 32·09 to 40·09 per 1,000. There is a wide variation in the ratio per 1,000 rejected and discharged in the various commands, and the high rate of rejections and discharges is receiving close attention. The outstanding changes in 1922-23 are the increase in diseases of the middle ear, other diseases of the heart, defects of the lower extremities, and valvular disease of the heart. There is however a decrease in rejections for defective vision and under chest measurement. It is noted that whenever the rejection rate on enlistment rises there is a corresponding increase in the ratio of discharges under six months' service.

The third section of the report is devoted to a consideration of the health of the Army in the various commands. Under each command there is a table showing the average strength, admissions into hospital, deaths, numbers invalided and numbers constantly sick during the year 1923, and the ratios per 1,000 of strength. There are also a few notes on the principal causes of admission to hospital. On looking through these tables it is remarkable how often at home inflammation of the tonsils heads the list of admissions to hospital and is closely followed by gonorrhœa, inflammation of areolar tissue and inflammation of the bronchi. Inflammation of the tonsils alone is responsible for several thousand admissions to hospital. Obviously this is a subject on which the specialists in hygiene and pathology in commands should concentrate their efforts, and in which team work will give the best results. Much good work has been done, but we cannot be satisfied until this most serious cause of loss to the State has been brought under control.

In India malaria causes by far the largest number of admissions to hospital (10,875); as secondary causes gonorrhœa, inflammation of areolar tissue, dengue, inflammation of tonsils, and sand-fly fever are important. Waziristan and the Northern Command had an admission ratio for malaria of 464·5 per 1,000 compared with 82·3 per 1,000 for the rest of India. We are glad to see that an intensive study of vectors, breeding places, etc., is

now being made, which should lead to an amelioration of the position in Northern India.

Lack of space prevents us dealing more fully with this admirable report; but we think the extracts we have been able to make indicate clearly that it will be invaluable not only to the administrator and to the research worker, but also to the officer in medical charge of troops both at home and abroad, who will find its pages helpful in his routine duties and a source of inspiration for future work.

Clinical and other Notes.

CONGENITAL HYPERTROPHIC STENOSIS OF THE PYLORUS. TWO CASES WITH OPERATION AND RECOVERY.

By Major A. G. WELLS, D.S.O.

Royal Army Medical Corps.

Surgical Specialist, Shorncliffe.

I venture to publish an account of these two cases because of the comparative rarity of the condition and the unique opportunity afforded by one of them of seeing macroscopically the local effect of the operation four days after its performance. I can find no record of this having been seen at such an early date during life.

The fact that the two cases occurred within three months, is also interesting, especially as, so far as I am able to trace, they are the only cases ever received in the Families Hospital of this station. Another interesting feature was that the second case was a girl, although the percentage of boys in this condition is said to be over eighty per cent.

Case 1.—A. M., a male child (the first) aged three weeks, was admitted to the Helena Families Hospital on July 2, 1925, with the following history: Born in the Helena Hospital on June 8, a full-time apparently healthy infant weighing eight pounds, twelve ounces. Labour was normal and the child breast-fed. Discharged on fourteenth day weighing 8 pounds 10½ ounces. Six days previous to admission the child began to vomit, sometimes immediately and sometimes two to three hours after food. The vomit was described as forcible and to contain nothing but partly digested milk. There had been constipation which for four days had been absolute; and wasting was progressive.

On admission there was very marked wasting and signs of dehydration. The skin had lost its elasticity and the child appeared *in extremis.* Weight six pounds, twelve ounces. The abdomen was somewhat retracted and after a feed, marked gastric peristalsis from left to right was visible. The vomiting was projectile and a small hard lump could be felt in the region

of the pylorus. The stomach was washed out and glucose and saline per rectum given.

The condition of the child was so bad it did not seem probable that it would survive an operation. However, as it was obviously the only hope of saving its life, the mother's consent was obtained and under chloroform anæsthesia the abdomen was opened by a right paramedian incision. An enormously dilated stomach immediately presented and on being lifted up the hypertrophied pylorus came into view. It presented the typical appearance described in this condition. The muscular fibres were divided by a longitudinal incision and separated by a blunt dissection until the mucosa presented. Unfortunately, in making the incision through the muscular fibres the duodenum was snicked. The minute opening was closed with one Lembert suture of fine catgut. The abdomen was then closed in the usual way. The child stood the operation extraordinarily well and exhibited no signs of collapse.

The first feed, consisting of two drams of breast milk and two drams of barley water, was given six hours after operation and continued three-hourly. Rectal saline and glucose was also continued.

The following day the bowels opened once naturally, the stool containing some mucus but being otherwise normal. Gastric lavage was continued and there was no vomiting.

The next day the feeds were increased to ½ ounce milk and ½ ounce barley water, three-hourly.

From this point onwards, feeds were gradually increased until on the fifth day the child was put to the breast in the normal way. Improvement was rapid and continuous and on July 28 he was discharged hospital weighing seven pounds fifteen ounces. When seen a few days ago, the child was in every way healthy and normal.

Case 2.—B. N., a female child (the second), aged 5 weeks, was admitted to hospital on September 28, 1925, with the following history. Born at the Helena Hospital, August 25, 1925, a full-time apparently healthy child, weighing seven pounds eight ounces, breast-fed, and discharged on the fifteenth day weighing seven pounds four ounces. Three days before admission she began to vomit, sometimes immediately and sometimes one to two hours after food. The vomiting was projectile and consisted of partly digested milk. Constipation had been marked but not absolute, and the wasting gradual.

On examination she presented the characteristic signs and symptoms except that a definite tumour could not be felt. This, however, became very palpable under anæsthesia.

Operation was performed almost immediately, and the classical appearance exactly similar to the first case was seen. Rammstedt's procedure was carried out and the abdomen closed. In spite of this child being in a far better condition, she suffered from marked post-operative shock, but rapidly responded to the usual remedies. Feeding was commenced eight

hours after operation and repeated two-hourly. The vomiting however persisted although less projectile in character. Gastric lavage and rectal glucose and saline was continued. On the fourth day after operation the child was still vomiting but less frequently. She was not making much headway and had constantly cried. On examination of the wound it was found that the stitches had all given way and omentum and intestine was protruding from the wound. I attribute this to the constant vomiting and crying combined with the malnutrition of the tissues.

The child was taken at once to the theatre, anæsthetized, and the parts examined. I was thus given the valuable opportunity of seeing the result of the operation after such a short time. The stomach showed no signs of distention although naturally still somewhat larger than normal. The incision in the pyloric muscle-fibres was well open with the mucosa bulging through and covered with lymph. The thickness of the hypertrophied muscle-fibres was about half what it was at the previous operation. I was able to squeeze some of the stomach contents quite easily through into the duodenum, proving that the pylorus was functioning adequately. There were no adhesions and the small bowel which had been completely collapsed was found healthy and of normal calibre. The peritoneum was sewn up with difficulty owing to the unhealthy edges, and the muscle and skin wounds brought together, four deep tension satures of silkworm gut being used in addition to the usual superficial interrupted sutures.

From this point the child made slow but steady progress, and at the time of writing is taking normal breast feeds without any vomiting and is gaining weight. This in spite of the fact that all the silkworm gut sutures have again practically given way. However, the wound although gaping, is covered with granulations and is healing.

I am indebted to Captain C. F. Burton, M.C., R.A.M.C., Officer Commanding, Helena Families Hospital, for the use of his notes, and to him and the ladies of the Q.A.M.F.N.S., of that hospital, for the skill and devotion with which these cases were treated, and to which I consider their recovery is entirely due. My thanks are also due to the Senior Medical Officer, Shorncliffe Area, for permission to publish these notes.

THE USE OF EMETINE IN TREATING BILHARZIA DISEASE IN THE CHILD.

By F. G. CAWSTON, M.D.Cantab.

Some time ago I was approached by an officer of the Royal Army Medical Corps who had been called upon to treat some children who were suffering from chronic hæmaturia associated with the presence of *Schistosoma hæmatobium.* Unfortunately the fresh-water mollusc responsible for the spread of this parasite has not yet been recovered from the locality in which these children acquired the infection. As there were reasons against

intravenous injections in these cases, I recommended intramuscular injections of emetine. When careful regard is paid to cardiac depression in the third week of treatment, and local muscular tenderness is avoided by dissolving the emetine in a 1 per cent carbolic acid solution, or by an occasional hot sea-water bath, a permanent cure is assured in all patients under the age of 15 that are able to tolerate a total dose of from 12 to 15 grains in not more than twenty-four days.

I have cured a patient by intravenous injections of antimony who had resisted subcutaneous injections of emetine given in small doses twice daily for about three weeks. $11\frac{3}{4}$ grains of emetine given intramuscularly over a period of twenty-two days failed to cure a patient of mine who, five months later, was permanently cured by a further series of injections with a total of only $8\frac{1}{2}$ grains in twenty days. $10\frac{3}{4}$ grains failed to cure a boy of 10, when given over a period of 40 days; but 10 months later he was cured by $13\frac{1}{2}$ grains in 24 days. $10\frac{1}{3}$ grains in 16 days failed to cure a boy of 14, who appeared to be permanently cured after receiving a further total of $13\frac{1}{2}$ grains in nineteen days nine months later.

Although a few days' rest in bed and the oral administration of some preparation of digitalis may be sufficient to counteract any detrimental effect caused by the use of those larger doses of emetine which are essential to produce a permanent cure of bilharzia disease; yet, in view of the fact that these parasites tend to die out of themselves, it is better to risk an incomplete cure than to produce permanent damage to the heart of a bilharzia case by continuing the use of emetine after the pulse has become rapid. When tartar emetic is obtained in powders from the local chemist, from time to time one is sure to get rather serious toxic effects from impurities in the powders supplied; however, the combined tartar emetic and saline tablets which are now prepared by the leading druggists for dissolving in boiling tap water, just before use, are so free from toxic effects in the doses required to produce permanent cures for bilharzia patients, that the use of emetine may be regarded as unwarranted in all cases where intravenous injections can be employed.

The following table indicates the difficulty which may be experienced in deciding which drug to employ and what doses to use in young persons. They were members of the same family who had contracted bilharzia disease from a Natal river, and numerous spine-pointed ova were found in the urine; an elder brother had been cured by hospital treatment lasting about two months. They came to my consulting room unattended, and showed no fear of the injections.

In the case of the little girl, no suitable veins were observed, so that treatment was discontinued on the eighteenth day on account of cardiac depression due to the emetine. The little boy of 9 picked up well, as soon as the tartar emetic injections were commenced; his brother of 14 received the two injections of emetine and a few days' treatment with sodium

sulphate for associated dysentery which responded rapidly to this line of treatment.

	GIRL OF 12.	BOY OF $9\frac{3}{4}$.	BOY OF 14.
1st day	Emetine, $\frac{1}{2}$ gr. (ova ×)	Emetine, $\frac{1}{2}$ gr. (ova ×)	Tartar emetic, $\frac{1}{4}$ gr. (ova ×)
2nd ,,	,, $\frac{3}{4}$,,	,, $\frac{3}{4}$,,	,, $\frac{1}{3}$,,
3rd ,,	,, 1 ,,	,, $\frac{7}{8}$,,	,, $\frac{1}{2}$,,
4th ,,	,, 1 ,,	,, 1 ,,	,, $\frac{1}{2}$,,
5th ,,	,, 1 ,,	—	—
6th ,,	—	,, 1 ,, Vomited later	,, $\frac{4}{7}$,,
7th	,, 1 ,,	,, 1 gr. Vomited later	,, $\frac{5}{6}$,, (ova ×) Cough
8th ,,	,, $1\frac{1}{8}$,, Vomited later	— Urine clearer	—
9th ,,	—	,, 1 gr.	,, $\frac{5}{6}$ gr. Cough
10th ,,	, 1 gr.	—	Emetine, 1 gr.
11th ,,	—	—	—
12th ,,	—	—	Tartar emetic, $\frac{5}{8}$ gr.
13th ,,	,, $1\frac{1}{4}$,, Vomited later	,, $1\frac{1}{8}$ gr. Many dead ova vomited	Emetine, 1 gr.
14th ,,	—	Tartar emetic, $\frac{1}{4}$ gr.	Tartar emetic, $\frac{3}{4}$ gr. Fewer ova
15th ,,	,, 1 gr.	,, $\frac{1}{2}$,,	,, $\frac{3}{4}$ gr.
16th ,,	—	—	,, $\frac{3}{4}$,,
18th ,,	,, 1 ,,	,, $\frac{3}{4}$,,	—
19th ,,	Feels cold and miserable	No injection	,, $\frac{4}{5}$,, Slight cough
20th ,,	Digitol by mouth	Tartar emetic, $\frac{1}{8}$ gr.	—
21st ,,	Rest in bed	,, 1 ,, Slight dyspnœa and cough	,, 1 gr. No ova. Slight cough
23rd ,,		Tartar emetic, $\frac{2}{3}$ gr. Very few degenerated ova	,, $\frac{3}{4}$ gr.
25th ,,	One ovum	Tartar emetic, $\frac{5}{8}$ gr. Slight cough	,, $\frac{5}{6}$,, Slight cough
27th ,,		Tartar emetic, $\frac{3}{4}$ gr. No ova. Slight cough	—
28th ,,	Recovered	—	,, $\frac{5}{6}$,, Slight cough
	Total—$11\frac{1}{2}$ gr. of emetine	$8\frac{1}{4}$ gr. of emetine and $6\frac{1}{4}$ gr. of tartar emetic	10 gr. of tartar emetic 2 gr. of emetine

Throughout the treatment I confined myself to the use of emetine "hypoloids," emetine "tabloids" and antimonii potassio-tartratis "soloids."

I observed the same degenerated changes taking place in the ova from the urine of these patients which I have observed in the ova of *Schistosoma mansoni*, *S. ? bovis* and *S. ? spindalis*, whilst the patients who harboured these parasites were being treated with either emetine or antimony.

Taking these cases by themselves, the gradual disappearance of ova that have been observed to become more and more degenerated during the course of injections with emetine or tartar emetic cannot be regarded as an infallible sign of cure; but my experience with similar cases would tend to show that I was justified in discontinuing the injections at this stage:—

10	gr.	of emetine	in	25	days	permanently	cured	a boy	of 13
$8\frac{1}{6}$	,,	,,	,,	22	,,	,,	,,	,,	,, 12
$8\frac{3}{6}$	,,	,,	,,	31	,,	,,	,,	,,	,, 12
$9\frac{2}{3}$	,,	,,	,,	17	,,	,,	,,	,,	,, 12
10	,,	,,	,,	22	,,	,,	,,	,,	,, 12
12	,,	,,	,,	31	,,	,,	,,	,,	,, 12
15	,,	,,	,,	23	,,	,,	,,	,,	,, 14
$17\frac{2}{3}$	,,	,,	,,	23	,,	,,	,,	,,	,, 15
$12\frac{1}{2}$	,,	,,	,,	22	,,	,,	,,	,,	,, 15
$17\frac{2}{3}$	,,	,,	,,	23	,,	,,	,,	,,	,, 17
$17\frac{1}{2}$	,,	,,	,,	21	,,	,,	,,	,,	,, 17
$18\frac{1}{2}$	,,	,,	,,	26	,,	,,	,,	,,	,, 17
18	,,	,,	,,	20	,,	,,	,,	,,	,, 20
$8\frac{5}{6}$	,,	,,	,,	31	,,	,,	,,	,, a girl	of 12
14	,,	,,	,,	31	,,	,,	,,	,,	,, 14

However the cardiac depression, evidenced by general malaise, a rapid pulse and weakness of the limbs made me discontinue the use of these large doses of emetine in all cases where tartar emetic could be employed, especially in view of the general improvement in health that was noted in nearly all cases treated with antimony during the course of the injections. Several patients who were suffering from "sandworm" disease and other skin conditions associated with bilharzia disease in Natal remarked on the rapid improvement that they themselves noticed as a result of the tartar emetic injections which would appear to be the most efficient remedy at present in use for "sandworm" disease in Natal.

REPORT ON A CASE OF ANAPHYLAXIS FOLLOWING INOCULATION OF ANTITETANIC SERUM.

By Captain J. P. MACNAMARA.
Royal Army Medical Corps.

As severe cases of anaphylaxis do not frequently occur in Army medical practice, the following report of one may be of some interest.

A major of the Dover Garrison fell off his horse, cutting his head. As the ground was fouled with stable manure, it was considered advisable to give him an A.T. serum.

On going into his history the following facts were ascertained :—

(1) He had received antidiphtheritic serum in 1909, but did not know the dose given him.

(2) He had been inoculated with a full dose of antitetanic serum in France in May, 1915, on account of a very slight wound in the thigh.

(3) After his inoculation in 1915 he had been in hospital from May until the end of July, on account of severe swelling of all his joints, accompanied by an urticarial rash. The slight wound he had received healed readily, and caused practically no inconvenience.

Taking the above facts into consideration, it was decided to give him a small preliminary dose, and accordingly eight minims of A.T. serum were injected intradermally, after which the following train of symptoms set in.

(1) Three minutes or so after the injection he complained of feeling queer and his eyes began to water, and he sneezed violently several times.

(2) Within a few more minutes he was vomiting copiously, appeared to be in a state of collapse and was taken to bed.

(3) By this time his eyelids and face began to swell considerably, his pulse was 100, small and feeble, he complained intensely of the cold and was shivering violently. Temperature was 96° F.

(4) At the same time as the symptoms appeared, he also complained of intense itching all over his body, this being specially marked on the soles of his feet. On examining his skin a diffuse erythematous rash was observed.

(5) Within half an hour of the injection, diarrhœa set in, and he went to stool three or four times in about an hour.

Treatment.—Patient was wrapped in blankets with hot-water bottles, and other stimulant treatment was given. After a few hours he was transferred to hospital, where he received further resuscitation treatment, and gradually recovered from his collapsed condition. His further progress was uneventful, and he was discharged from hospital five days later.

It is considered that this case emphasizes the necessity of injecting a small preliminary dose prior to the inoculation with a full dose in all cases in which a previous history of inoculation with sera is given.

The date shown on the phial of the A.T. serum used was December, 1918, but previous inoculations were carried out with the same batch of serum without any untoward results.

Echoes of the Past.

FLOTSAM AND JETSAM.

By Colonel S. F. Clark (R.P.).

V.

I am 10,000 miles from London and yet I am back in Kent. This apparently impossible thing has been done by crossing over from New South Wales to the little island of Tasmania, down in the "roaring forties." No longer is the landscape formed entirely of gum trees, and of strange, if beautiful, flowers, but one sees again the oaks, elms and ash trees of England, and here and there the hop fields of Kent. The country roads have resumed their hedges of hawthorn, the wild roses bloom on every side, and the buttercups and daisies, which for the last five years have been memories only, greet one with an unchanged simple beauty. The bracing wind blows shrewdly from the Antarctic snows, and places a colour on the cheeks of the maidens that no art can equal.

As the question of migration to Australia is beginning to loom large among those who find life in the Old World hard, it may be of interest to show how the luck of our Empire has held in enabling us to possess these great Antipodean lands. It may be that many of us think that Captain Cook was the first white man to find Australia, and that in doing so he just beat La Perouse, the ill-fated Frenchman ; but the facts are quite different.

Six hundred years ago Marco Polo had an inkling of the existence of this vast continent, while, somewhere about the sixteenth century, the Spaniards and the Portuguese were active along the coast of Western Australia. During the next hundred years the Dutch not only explored in a desultory manner along the west, south and north-west coasts, but they actually landed in places and gave some of them names which they still hold.

In A.D. 1642, Tasman, a Hollander, discovered both New Zealand and Tasmania, and named the latter Van Diemen's Land, after the Dutch Governor of Batavia who had sent him out to explore. Some accounts say that he hoisted the Dutch flag on this island and took formal possession of it in the name of his country, but as Holland did not follow up his action her rights to it presumably lapsed.

The invaluable service that Captain Cook did for his countrymen was to hoist the British flag in New Zealand in 1769, and at Botany Bay in the year following. The history of Australia began in 1788, when Governor Philip arrived with the first batch of convicts, to form a settlement in this New World. He cast anchor in Botany Bay, but as he found the place to be unsuitable for his purpose, he left his ships there and set out in a boat to seek a better spot, which he found where Sydney now stands. It was when he got back to his fleet that he was astonished by the arrival of the two ships of La Perouse, who sailed away a few days afterwards, and disappeared from mortal ken.

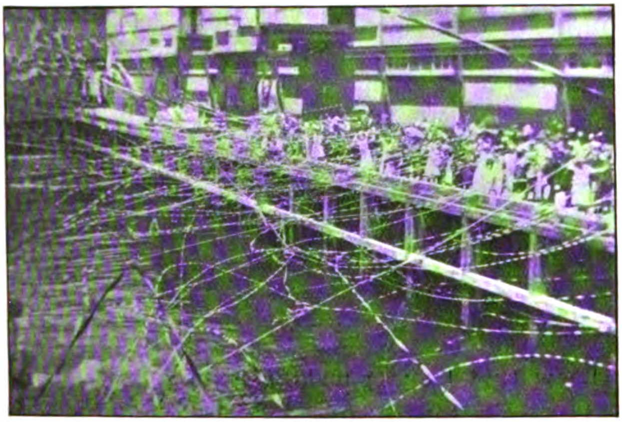
A monument to his memory stands on the shores of Botany Bay, on a small plot of land which has been given to France and which has boundary posts painted red, white and blue, and marked R.F. (République Française). It cannot be generally known that a few square yards of Australia are French soil. Close to the memorial is a grave which holds the remains of Père le Receveur, the naturalist of the expedition, who is proudly described on his tombstone as Galliæ Sacerdos—a priest of France. This is the earliest known grave in Australia, for though the first British subject to be buried in this new land was one of Captain Cook's seamen, named Sutherland, who died in 1770, no one knows where he lies.

The French claim to have landed in Western Australia in 1503, so it is evident that they, or the Spaniards, the Portuguese, or the Dutch, could have picked up these colonies before we did, but in those days they were very far away, and offered no inducement for trade. No doubt England would have obtained them in the end, as spoils of war or otherwise.

We left Sydney at the end of November, 1924, and had our first experience at the ship-end of the kindly and sentimental Australian custom

of using "streamers" when a vessel sails. These are rolls of narrow paper, many yards long, and of all colours, one end being held by the passenger and the other by a friend on shore. When the hour of sailing draws near, a regular canopy of red, blue, yellow, green and white streamers stretches from the ship to the wharf—the ends in the hands of young men and maidens, old men and children. When a great liner leaves for England, this is really a wonderful sight. The idea is to keep in contact with the friend for as long as possible, and many passengers have up to a dozen streamers in their hands, the end of each being held by a different person. As the ship moves off, the crowd on the wharf advances in a body, skilfully letting out the rolls, which finally break one by one. The last one or two attain a surprising length before they snap, and sever the link between friend and friend. It is a pretty custom, worthy of imitation in England.

We had a very rough passage, and as we coasted along the eastern side of Tasmania, and noted its forbidding and rock-bound aspect, we realized



Streamers: Ship left Wharf.

why all new-comers turned in to the attractive estuary which forms the magnificent harbour of Hobart. Tasman must have found it, for one of its bays is still known by the name which he gave it, and when Bass and Flinders made their historic voyage round the island they spoke so well of this harbour, which they must have entered, that the first settlers were directed to make for it. It was in 1803 that the authorities of New South Wales became perturbed by the knowledge that a French captain, named D'Escastraux, was poking about in the south of the island, so they sent a Lieutenant Bowen, with a handful of soldiers and convicts, to form a settlement, which he did at Risdon. In 1804, however, Lieutenant-Colonel Collins, Royal Marines, who had come from England to make a start in Victoria—then known as New Holland—and who had settled near

where Melbourne now stands, got tired of the place in three months, and, apparently, on his own initiative, he transferred his party of soldiers and convicts to Van Diemen's Land, and founded Hobart, a few miles from Risdon. He became the first Governor, and Hobart was made the capital, while Risdon faded out.

Like the mainland of Australia, Tasmania was peopled first by convicts and their guards, and the malefactors did great and permanent service by making roads and bridges, erecting substantial buildings and generally giving the place a fair start. Various regiments came out, apparently mainly to assist in keeping order, and we found evidence that the R.A.M.C. of those days did duty at these outposts of Empire. Among the tombstones ranged round an old graveyard in Hobart was a memorial erected by the officers of the 50th Regiment to the memory of their assistant surgeon, Gregor McGregor, who died on April 24, 1835, aged 25. After expressing the regard of his brother officers for him, and their sorrow at his demise, the stone records the tragic circumstances of his death. On the eve of completing a voyage from England to Van Diemen's Land, he was wrecked in the convict ship George III, which struck on the Actæon Reef, on April 12, 1835. Along with others he got to land, but next day he wandered alone into the woods and lost himself, and, when found, he was so exhausted that he never recovered, "but gradually declined, and a few days after closed his valuable life."

In a local exhibition of old-time relics were a number of visiting cards from the house of an early settler, and among them were those of "Dr. Dick, 12th Regiment," and "Dr. Hadley, 99th Regiment."

An interesting stone in the old cemetery was that from the grave of the first European born in Tasmania, at Risdon—probably the son of a soldier. He was George Kearly, who was born on July 9, 1804; but poor little George never knew that he was making history, for only six days later "came the blind Fury with his abhorred shears, and slit the thin-spun life."

The lines on one stone seemed to me of singular beauty; they were:—

> Forgive, blest shade, the tributary tear
> Which mourns thy exit from a world like this,
> Forgive the wish that would have kept thee here,
> And stayed thy progress to the realms of bliss.

We stayed in Hobart for a week, but the weather was so cold that we postponed long distance sight-seeing in motor cars, and contented ourselves with exploring the city and its neighbourhood. We went up the river Derwent in a pleasure steamer to New Norfolk, and were enchanted with the English look of the scenery, and the wonderful reflections in the calm water.

The exhibition, or museum, of old time relics was of great interest, and practically everything in it went back to convict days. There were leg

irons weighing eighty pounds, and a convict "anchor," a mass of metal, 121 pounds in weight, with a ring on it to which the unfortunate prisoner could be chained. Many of the early official books and documents, and other records concerning the transportees, were on view, while the numerous plaster casts of the heads of various notorious murderers, in the Chamber of Horrors, were somewhat disconcerting, for mixed up with them were the heads of Lord Brougham, Benjamin Franklin, Marcus Clark, and other highly respectable people.

There was a very excellent copy of a proclamation by the Governor, dated 1816. It was intended to impress upon the aborigines—of whom not one now remains—the even-handedness of British justice, but, as they were unable to read, the matter was expressed pictorially in four coloured sketches. The first showed a black spearing a white man, and the second represented the black being hanged on a tree by a soldier, with two officials in gorgeous uniform looking on, and the dead body of the murdered man lying at the foot of the tree. The third picture gave a soldier shooting an aboriginal, while the fourth showed this white murderer being hanged on the same tree as mentioned above, by the same executioner, in presence of the same officials, with the dead body of the black victim in the foreground. A most ingenious and convincing work of art.

There was also the signboard of the "Spotted Cow," a well-known public house of early Hobart. This was quite an elaborate affair, and had been designed and painted by a convict. The middle of the sign showed sailors and soldiers drinking at the bar, with this inscription on the top .—

> "Since man has proved to be unjust
> How can I tell what man to trust,
> And to prevent future sorrow,
> Pay to-day, I'll trust to-morrow."

The metre seems to stumble a little in the third line. The lower part of the board again emphasizes the disinclination of the landlord to give credit, by the following spasm :—

> "My ale is good, my measure just,
> My profits small, I cannot trust,
> My care here is no man's sorrow,
> So pay to-day, I'll trust to-morrow."

By going from Hobart in the south to Launceston in the north by train, and returning by motor car, we got a fair idea of the interior of the island. Many places bear English names, while Launceston, like its mother town in the old land, lies on the river Tamar in the county of Cornwall. The chief sight here is the Cataract Gorge, a really fine, narrow, rocky valley, 2 miles long, through which the river South Esk makes its way with all the tumult and action ascribed to the waters coming down at Lodore. The remarkable thing about this splendid piece of scenery is that the beginning of it is practically in the town itself.

The smallness of the world was exemplified by our finding here an old man from Lydd, in Kent. He was intensely interested in hearing that we

Destruction of Timber: Tasmania.

The Estate Agent's Optimism: Australia.

had been there, and he told us that his grandfather had been a smuggler, and that he himself would be one also, if he had the chance.

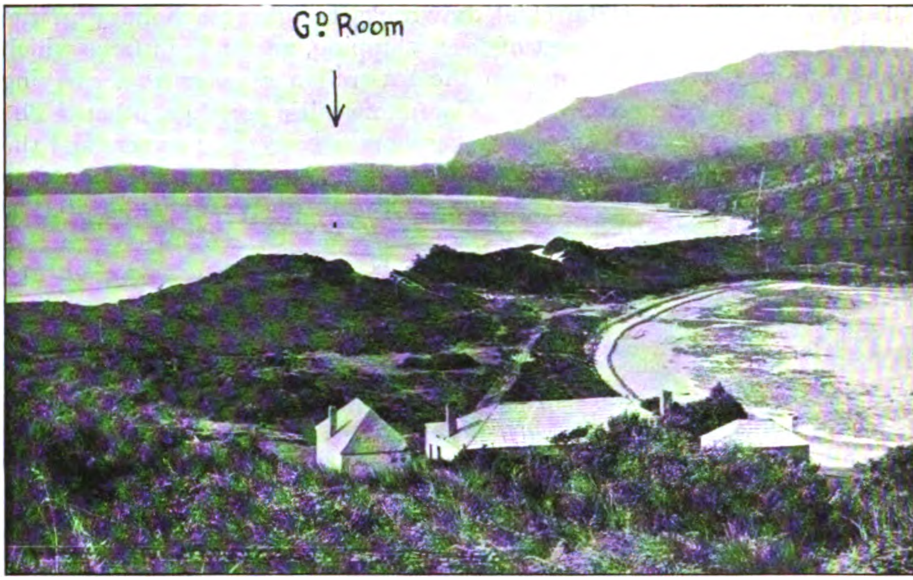
Tasmania is undoubtedly the holiday resort for the people of Melbourne,

for the run across is a matter of only 17 hours or so, but at present the annual shipping trouble is so acute that no vessels at all are making the journey. This is one of the chief drawbacks to taking a holiday in the island. For the encouragement of local shipping, an act is in force which forbids any vessel which is not on the Australian register from carrying either passengers or cargo from one Commonwealth port to another. The local seamen make full use of this Act to harass both their owners and the public, and Tasmania is so tired of being isolated, and having its immense tourist traffic ruined by the conduct of the Seamen's Union, that it is talking of breaking away from the Commonwealth.

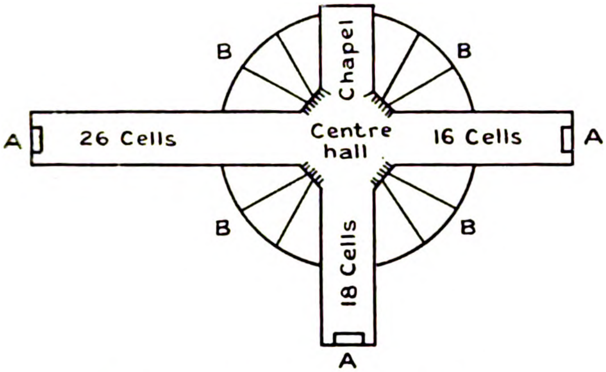
We were fortunate to get there and back—640 miles each way—during lucid intervals in the hold-up. At this moment every passenger boat on the Australian register is out of commission.

There is much to see in the neighbourhood of Hobart, and no tourist misses the trip to Port Arthur, sixty miles away, for that place has been made famous by the book, "For The Term Of His Natural Life." There have been over 7,000 convicts in Tasmania at one time, and those that gave extra trouble were sent to this penal settlement, where the ruins of the buildings that were in use are still to be seen. From the Government point of view, one of the chief advantages of this spot was the difficulty of escape from it, owing to the narrowness of the isthmus at Eagle Hawk Neck. A military guard was stationed there, and the guardroom still stands, while a picture in the museum I have mentioned shows the line of thirteen fierce dogs which barred all unauthorized passage. The isthmus looks hardly 100 yards wide, and each dog was so chained that it could get to within six inches of its neighbour on each side. On the western side of the Neck, the water is so shallow that any fugitive must have attempted to elude the dogs by that channel, but it is said, that, to counteract this move, offal was thrown into the water regularly to encourage the presence of sharks. Even if a man did escape here, the inhospitable and uninhabited bush soon claimed his life.

The convicts at Port Arthur worked in the open-air all day, and were lodged at night in the Penitentiary—a building of several storeys, built of brick, and not very formidable-looking—but the refractory ones were confined in a dreadful place, known as the Model Prison, most of which still stands. This was an erection of only one storey, containing sixty cells, built of large blocks of dressed stone. Each cell had one small grated window high up, and the horror of this prison was that the captives saw nobody except the warders, to whom they were not allowed to speak. The cells were in three corridors, which met at a central hall, from where doors led to the exercise yards. Here each convict had a length of thirty or forty feet to walk in, walled off from his neighbours. He was exercised here for one hour in the morning and one in the afternoon, in solitude, and spent the rest of his time in his cell—probably with nothing to do. Even in the chapel the seats were so arranged that no prisoner could see any other inmate. According to the guide, men were kept in this Model

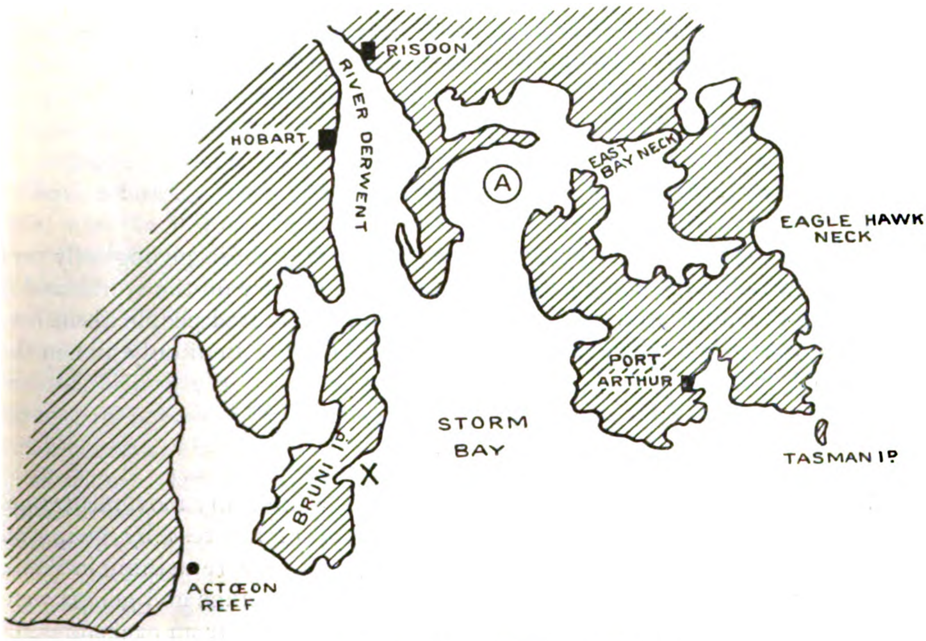


River Derwent, Tasmania.



Ground Plan of Model Prison, Port Arthur.

A—Fire places.
B—Exercise yards, each with its own door, and walled off.



Diagrammatic Sketch Map : Vicinity of Hobart.

A—Frederick Henry Bay—so named by Tasman, A.D. 1642.
X—Captain Cook landed, A.D. 1777.

Prison for one to five years—enough to drive them mad, one would think. We were shown the dark cell, and marvelled that any inmate of it got enough air to sustain life.

A short distance away is a small island, known as the Island of the Dead, because everybody who died at Port Arthur was buried there. It is believed to have taken over one thousand bodies, but little or no trace of graves remains now.

The road from Hobart to Port Arthur runs through much fine woodland scenery, but although some timber is being obtained, and although one knows that land must be cleared to make it available for agriculture, yet it is saddening to see the terrible waste of wood that goes on. Most of the ring-barked and dead trees have been allowed to rot, although many of them were of great size. The same thing goes on all over Australia.

A unique sight that we witnessed in Hobart was the official reception of the only member of the Labour party that has ever been sent out to govern a State. Not one man in the crowd gave him a hurrah, but the local evening paper announced that "the air was rent with cheers." We are somewhat sceptical about the accuracy of reports in the press now. The people were not hostile to the Governor in any way—they simply are not given to cheering.

As a contribution to the subject of the persistence of malaria, I should like to mention that my last week in Hobart was spoiled by a sharp attack of this ailment, which shook me up very considerably. It is six years and nine months since I was invalided from Macedonia under the Y scheme (chronic malaria), and any symptoms of the disease which had shown themselves in the interval were so slight that I considered myself to be cured. The cold winds of Hobart proved me to be wrong, and compelled me to take to my bed.

There is something very fascinating in seeing these geologically very old lands which have come so recently into the picture of the world, and it is strange to come so far and to find no teeming coloured people about one. But what a grand place England would be to live in if only it had the climate of Sydney.

VI.

During my time in the Army I kept a record of my movements, and have now tabulated the results, which may be of interest by giving an idea of how our service is apportioned. Except for remaining in South Africa for an extra year, at my own request, my comings and goings were all in the ordinary course of Army life, and were free from exchanges, or any other factor under my own control. The period covered is from September 30, 1886, when I joined at Netley, to August 9, 1919, both inclusive—thirty-three years, less fifty-one days.

Between the first date and the second 12,001 days ran their courses, and I take this figure as the time I passed on the active list. I was on holiday leave for approximately 950 days, or 7·9 per cent of my service, and on sick leave for 187 days, or 1·6 per cent. In addition, I was sick in hospital, or in quarters, for about seventy days—0·58 per cent. Of these last two items, 128 days of sick leave and 30 days in hospital occurred during the late war.

I served in England for 4,335 days (36 per cent) and abroad and at sea for 7,666 days (64 per cent). These figures are worth dividing into two periods, the line of demarkation being the date of my arrival in England from my last pre-war tour of foreign service. On that day I had been out of the United Kingdom for 6,675 days out of 8,889, or 75 per cent. There were still 3,112 days to go before my retirement, and 2,121 of them (68 per cent) were passed at home, and 991 (32 per cent) in France and in Macedonia. These figures were affected by the fact that I was invalided from France with a broken leg, and from Macedonia for repeated attacks of malaria, in addition to being with a Kitchener Division for several months before it went overseas.

During my service I travelled approximately 98,600 miles by sea in twenty-five different ships, whose flags included the white, blue and red ensigns, and the emblems of America, France, Holland, Japan and China.

Including passages on sick leave, 77,050 of these miles, in sixteen ships, were traversed on duty, and the balance—21,550 miles in nine ships—on holiday. May I be pardoned for stating here that—excluding short trips under twenty-four hours—I have in all gone 121,000 miles in thirty-two different vessels during my life. While on the active list I was at sea for 421 days, of which 265 were on duty, including sick leave.

Inclusive of periods under canvas and on the march, I have slept, on duty, at about sixty-two different places at home, and some 104 abroad—exclusive of nights passed on board ship at anchor in numerous harbours or ports.

Of my 12,001 days, 126 (under 1 per cent) were passed as a surgeon on probation at Netley, and 4,383 (36·5 per cent) as a surgeon, surgeon-captain, or captain. The greatest number, 4,657 (38·8 per cent), found me a major, while I was a lieutenant-colonel for 1,204 days (10 per cent nearly), and a colonel for 1,631 (13.5 per cent).

It would appear, then, that our complaint of having an excessive proportion of service abroad is not devoid of some foundation, and that an average R.A.M.C. officer may count upon traversing by sea on duty every ten or eleven years a greater distance than that representing the circumference of the globe at the equator. One begins to see what immense sums must be expended upon the transport of a world-wide army, and why military estimates are high in an empire like ours.

Current Literature.

Med. I. Memoranda. New Series. No. 78 (Ministry of Health).—Note by Dr. S. P. James on the principles to be followed in measures for controlling mosquitoes in England.

Contrary to popular expectation it has been found that, even in England, the control of mosquitoes is a difficult task which is not to be accomplished without considerable expenditure, nor without the active assistance of the inhabitants of the locality concerned. A primary difficulty will be appreciated when it is said that twenty-six different kinds or species of mosquitoes occur in England, and that most of them have different habits and modes of life. Some do not bite human beings; some bite only in houses; others bite only in the open air; some are troublesome in the spring, others in the autumn; some are prevalent only within a short distance from the water in which they breed, others spread by flight over a wide area; some utilize as breeding places only particular kinds of water, others deposit their eggs on any kind of water, others scatter them on dry ground; some produce only one brood of adult insects each year, others two, others several; some pass the winter in the egg stage, others in the larval stage, others in the adult stage. It is essential to know all about these different habits because experience proves that measures which take account of them are much more effective than are measures based on the incorrect assumption that in general all mosquitoes have the same habits and mode of life, and can be dealt with in the same way. Therefore, it may be said that the first step to take in a locality where it is proposed to commence anti-mosquito work is to study these insects in the area and especially to ascertain what species are present, what species are troublesome or dangerous, and what is the distribution, prevalence, seasonal incidence, life-history and habits of each of the species separately. Whenever possible, this inquiry should be placed in the hands of someone who has a good knowledge of field and systematic entomology and can devote his whole time to the work. The inquiry will show how necessary it is to study each species separately and how useful it is to have accurate knowledge, not only of the particular species actually responsible for the nuisance complained of, but also of other species which may be prevalent but are not troublesome. Of the twenty-six different species of mosquitoes which occur in England, only fourteen are important as being vicious biters whose distribution and prevalence in certain years, or at certain seasons, are such that they must be classed as dangerous or troublesome pests. Their names are:—

Ochlerotatus punctor (Kirby).
,, *maculatus* (Meigen).
,, *annulipes* (Meigen).
,, *rusticus* (Rossi).
,, *detritus* (Halliday).
,, *caspius* (Pallas).

Ochlerotatus lutescens (Fabricius).
Culex pipiens Linnæus.
Ædes cinereus Meigen.
Finlaya geniculata (Olivier).
Theobaldia annulata (Schrank).
Anopheles maculipennis Meigen.
,, *bifurcatus* (Linnæus).
,, *plumbeus* Stephens.

The identification of nearly all these species in both their larval and adult stages is fully described and illustrated in "A Handbook of British Mosquitoes," by W. D. Lang, M.A., D.Sc., which can be obtained at the British Museum (Natural History), Cromwell Road, London. The few species which had not been found when that handbook was written are described and figured in "A Revision of the Mosquitoes of the Palæarctic Region," by F. W. Edwards, published in the *Bulletin of Entomological Research*, vol. xii, 1921-22, p. 263, which can be obtained from the Imperial Bureau of Entomology, 41, Queen's Gate, London, S.W. It is fortunate that, as a rule, not more than two or three species are troublesome in the same locality, so that the task of the entomologist who has to study their habits in the area is not so overwhelming as might be anticipated.

When the preliminary study is completed it will have to be decided against what species and by what methods the measures shall be conducted.

The species to be attacked should be limited to those which are proved, by careful local inquiry, to be the cause of the trouble complained of, and the methods to be employed should be based on a knowledge of the life history and habits of the species concerned. It should not be assumed that it is always necessary to take measures for destroying larvæ and for dealing with breeding places, or that such measures comprise all the important methods of attack against mosquitoes. On the contrary, the first step to take is to obtain accurate information of the nature of the complaints, and to ascertain whether any of the mosquitoes which are responsible for them can be dealt with otherwise than by anti-larval methods, which are always difficult, usually costly, and often fail to remove the trouble of which specific complaint is made. Measures against the insect in the adult stage of its life are particularly applicable when the complaint is that mosquitoes are troublesome in the interior of houses. Usually the species responsible for this complaint is *Culex pipiens*, but sometimes the responsible species is *Anopheles maculipennis*, and rarely it is *Theobaldia annulata*. *C. pipiens* is the commonest mosquito in some localities in England, but it is not often troublesome until the evenings begin to get cold in early autumn. At that season it enters houses freely and numerous specimens can be found resting on the walls, curtains, ceilings, etc., of living rooms and bedrooms. If the rooms are warm it may bite viciously. Later in the year it congregates in enormous numbers in cellars and outhouses, where it passes the winter in a sluggish, more or less "hibernating" condition. On warm days in early spring it becomes active again and leaves its winter

quarters to lay its eggs on the nearest collection of water. A week or two later its larvæ can be found in almost every natural and artificial collection of stagnant water, whether clean or foul, fresh or brackish. The first annual brood of adult insects emerges in May and subsequent broods emerge at irregular intervals during the summer. In late autumn all eggs which have not hatched into larvæ, and all larvæ which have not pupated, as well as all male adult insects, die, so that the species survives the winter in the adult female stage only. Therefore, the winter is the period of the year during which measures against the species are likely to be most effective, and particularly so because at that season the female insects can be found and killed in great numbers in the few sheltering places where they congregate. The following methods are employed for this purpose:—

(1) *Catching and Killing each Insect Separately.*—This method is useful in living rooms and bedrooms where fumigation or spraying is unsuitable and where, if the insects were killed by "swotting" them with a fly-flapper, the wall-paper would be spoiled by splashes of blood. Catching and killing is easily carried out if one is provided with a test-tube containing at its closed end a wad of cotton wool or a rubber plug impregnated with chloroform. While the mosquito is resting on the wall, place the open end of the test-tube gently over it. Keep the mouth of tube pressed against the wall and move the tube sideways. This will dislodge the mosquito from the wall and it will fly towards the closed end of the tube, where it will drop dead on meeting the vapour of the chloroform.

(2) *Catching and Killing the Insects in Groups.*—The test tube method just described is most convenient when the insects are present singly or in two's and three's. When there are considerable numbers the work can be done more quickly with a simple contrivance which is used in Holland. It is a light wooden bowl or open box about a foot in diameter, mounted on a long handle by means of a swivel joint. A pad of wool soaked in petroleum is placed in the bowl, which is then lifted by the handle to the ceiling or upper parts of the wall and placed over the groups of mosquitoes which are resting there. After a moment or two the mosquitoes drop into the petroleum-soaked wool, which is burnt when the work is finished.

(3) *Use of Vacuum-cleaning Machine.*—Householders who possess a portable vacuum-cleaning machine can obtain the same result by placing the cup-shaped nozzle of the outfit over, or near to, the mosquitoes which are resting on walls, curtains, ceilings, cobwebs, etc. This method has been used with fair success on farms round Amsterdam.

(4) *Fumigation.*—This is suitable in cellars, stables, outhouses, etc., where all entrances and exits can be effectively closed. Sulphur (one pound for every 1,000 cubic feet) set alight with the aid of a little methylated spirit, is the fumigant usually employed.

(5) *Spraying.*—This is suitable in tents and in attics, etc., where risk of fire must be avoided, and where it is of no consequence that the walls are wetted by the sprayed solution. The simplest spray which has been found

effective is a $2\frac{1}{2}$ per cent solution of potash soap, or alternately a three per cent solution of "lysol." The formula of a more potent solution is:—

Pyrethrum powder	.. .. ..	2 pounds
Spirit (methylated)	.. .. ..	1 gallon
Percolate		

To the percolated liquid add an equal volume of safrol; then add one ounce castor oil and $\frac{1}{2}$ ounce of soap. For use dilute 1 in 30.

The liquid should be sprayed with an apparatus which "atomizes" it as finely as possible.

(6) *Lime-washing.*—During very cold winters the condition of the insects in cellars and stables approaches that of true hibernation; they rest motionless and apparently lifeless with their bodies closely pressed against the wall. In this condition they can be killed during the operation of white-washing the cellars, stables and outhouses, but care should be taken to ensure that they are really destroyed, not simply driven out to take shelter in other buildings.

A second example in which it is preferable to deal with the adult insects which are actually causing trouble rather than with their larvæ and breeding places relates to the species *A. maculipennis.* This is a very important mosquito which in certain circumstances is responsible for malaria infection. It has been found in every rural district where it has been sought in England, but in greater numbers in low-lying marshy districts at the mouths of rivers than in the interior of the country. The adult insects pass most of their life in dwelling houses, stables and other buildings where they are sheltered from sun, wind and rain, and can readily obtain meals of blood from human beings and animals. The species is dangerous rather than troublesome, for it bites chiefly at night when people are asleep and its bite is seldom painful and rarely leaves a noticeable mark. It bites almost always in houses, seldom or never in the open air. Its breeding grounds are so extensive in area and so varied in kind that as a rule it is quite impracticable to reduce them to a degree which results in an appreciable diminution of the prevalence of the adult insects. In localities where this species is common, and particularly if the locality is one in which cases of malaria have occurred, the inhabitants should be instructed how to recognize the adult insects and how to catch and kill every specimen which can be found by daily search of bedrooms, the ceilings of stairs-landings, and all parts of the house where the adult insects are likely to rest. During the winter the attack against the adult insects can be carried out on a large scale (by the methods already described for *C. pipiens*) in the interior of stables, cellars, outhouses, etc., where they rest in a sluggish "hibernating" condition.

There is yet a third species, namely *T. annulata*, which is best dealt with in its adult stage. It is a large, easily recognizable mosquito of which isolated specimens are to be found not uncommonly in outdoor closets, occasionally in indoor bathrooms, lavatories and halls. It deposits its eggs, when they are fully developed, on the nearest collection of water, whether

clean or foul, and its breeding places may, therefore, be described as being various and difficult to control. It inflicts a painful bite, but because the adult insects usually occur singly or few in number, instances of its being the cause of a particular complaint are rare. For this reason, as well as because it is easier to deal with the adult insects than with their breeding places (which often include eddies, backwaters and " dead-ends " of streams and rivers) it is seldom practicable to undertake effective anti-larval measures against it. Systematic search with the object of catching and killing the adult insects should be made in outbuildings, not only during the period when the insects are active and liable to bite, but throughout the winter when they are in a sluggish condition and can be easily caught and destroyed. The procedure of catching and killing is the same as has already been described for *C. pipiens* and *A. maculipennis*.

If it is the case that, before the end of winter, it has not been possible to discover, and to deal effectively with, all the places where the female insects of these three species have been sheltering during that season, all that can be usefully done is to endeavour to prevent the emergence of the first new brood of adult insects by undertaking short, but very thorough, anti-larval measures in early spring, as will be described for some of the other species.

In England the three species above-mentioned are the only ones for which it should suffice to take measures against the adult insects. They are "domestic" species and are usually responsible for complaints of a mosquito nuisance in dwelling houses, stables and outbuildings. Unfortunately, however, most complaints are not concerned with mosquitoes in the interior of houses, but refer to bites inflicted out of doors, as for example when the persons bitten are sitting or working in their gardens, or picnicking in or near a wood, or on open ground near the seashore, or playing golf, or even walking along country lanes or across commons or park land. In these instances we are concerned with rural mosquitoes, sometimes classified as " sylvan species," " tree-breeding species," " swamp-breeding species," " salt-marsh species," " migratory species," etc. As a preliminary to dealing with these complaints, it is essential to locate definitely the place where the nuisance is experienced, and to determine what species of mosquito is responsible by catching some specimens there while they are in the act of biting. This is easily done by placing the open mouth of a test tube over the mosquito when it has settled on an outstretched hand and then plugging the mouth of the tube with a wad of cotton wool. Several specimens caught in this way should be kept for accurate determination of the species, the tubes being labelled with particulars of the locality, the circumstances in which the mosquito was biting, the date, time of day and the atmospheric conditions. When the name of the responsible species has been ascertained all available information should be collected about its habits in the adult stage, the larval stage and the egg stage of its life. It is especially important to know the manner in which the insect passes the winter, for that is invariably the period of the

year during which it can be most easily and effectively attacked. At present we do not know any more effective method of reducing the prevalence of species which are troublesome in the open air than an attack against their larvæ and breeding-places.

This attack must be planned with full knowledge of the life history of the particular species concerned. The species which can be dealt with most satisfactorily are those which have only one generation, or brood, during the year. This group includes in England, *O. maculatus, O. rusticus, O. annulipes* and *A. cinereus*. In a typical member of this group the whole brood of adult insects is hatched almost simultaneously in May. Their annual emergence can be studied by anyone who is accustomed to ramble about the countryside in spring. At that season most of the public roads and pathways across commons and through woods in the southern counties of England are fringed with shallow pools which on close inspection will be found to be teeming with mosquito larvæ. On a sunny day the larvæ can be detected by the quick change of glistening colour that passes over the water when, frightened by a shadow, all of them simultaneously quit the surface film and dive to the bottom. In a few days the larvæ pupate, and a little later all the countryside becomes alive with the adult insects. The shallow pools quickly dry up and disappear, but the mosquitoes which have emerged from them live throughout the summer. During July to September they scatter their eggs, not on water (as is generally believed) but indiscriminately over low-lying land, and particularly over depressions in which fallen leaves have collected. At the onset of winter all the adult insects die, but the eggs which they have laid remain, resistant to cold and drought, until the rains of winter and the following spring cover them and provide the necessary factors for the hatching and growth of the larvæ. When May comes the larvæ change to pupæ and the pupæ to adult insects as above described. This life history may be represented diagrammatically thus :—

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
•	•	–	–	+	+	+ •	+ •	+ •	•	•	•

• = egg.
– = larva.
+ = fly.

It will be seen that by far the greater part of the life of this group of mosquitoes is passed in the egg stage, and that the period passed in the larval stage (the only stage which it is practicable to destroy) is very short. The measures for killing larvæ must be carried out between March and the end of April, for after that period there are no larvæ of this group to destroy. Therefore, when measures have been delayed until the receipt of complaints that people are being bitten, nothing that will be effective during the current season can be done. During the annual spring search

for larvæ, every yard of the area to be dealt with must be walked over and inspected carefully; it must be kept in mind that during the previous summer the eggs were scattered everywhere over the ground, and that in the following spring, when the ground has become waterlogged by the winter rains, a collection of water which perhaps is not greater than can be scooped up with a spoon may be swarming with larvæ. The search must also be made with full knowledge of the various kinds of breeding places in which the larvæ of different species will be found, as, for example, that *F. geniculata* and *A. plumbeus* breed in water in tree-holes. For killing the larvæ it is preferable to use a "larvicide" (such as crude cresol or other preparation of carbolic acid diluted with water) than to use oil. The larvicide should be sprayed from a watering-can or from a special "knapsack sprayer," sufficient being used to make the water milky after it has been well stirred with a stick. As animals will not drink water which has been treated with larvicidal disinfectants, troughs containing fresh water must be provided for them during the period of the anti-larval operations. If the operations are done when the water in pools and depressions of the ground is at its highest level, only one treatment is required, but if there is heavy rain after the first treatment a second may be necessary, because the rain will have washed more eggs from higher ground into the pools.

By these measures, carried out thoroughly during a few days at the correct period of the year, it ought to be possible to abolish all risk that any of the species of mosquitoes dealt with will subsequently be a nuisance in the area during the year in which the work has been done.

In dealing with species which have two broods during the year the same line of action must be followed, but it is naturally more difficult to obtain a completely successful result. *A. bifurcatus* is a species in this group. It passes the winter in the larval stage only, but the larvæ, from the beginning of the winter, are nearly full-grown, so that they are ready to change to pupæ and then to flies as early in the new year as February. Towards the end of that month male and female adult insects can be found among the long grass near the pools from which they emerged. Therefore, anti-larval measures to prevent the emergence of this first brood must be carried out not later than the end of January or the first week of February. The larvæ which will produce the second brood should be dealt with in pools during June and July, but if the previous attack against the wintering larvæ has been thoroughly carried out the second brood will be few in number and relatively unimportant.

Lastly, there is the group of English mosquitoes which have several broods during the year, or in which the individual mosquitoes emerge at irregular intervals so that it is not possible definitely to state the number of broods. From the point of view of the nuisance which they cause, the most important species in this group are *O. detritus* and *O. caspius*. They are the chief cause of complaints of a mosquito nuisance at seaside resorts on the east and south coast, where they breed extensively on marsh and other grass land which is subject to overflow by sea or river water during high

tides (salt marshes or "saltings"). In favourable years the first brood of adult insects is hatched as early as March or the beginning of April and the last as late as December. The eggs are scattered singly over the marshes throughout the summer. Even after being on dry ground for months they develop into larvæ as soon as water covers them. If they are not reached by water during one season, they remain alive until the next season, when perhaps the floods caused by an exceptionally high tide may form temporary pools on ground which previously was quite dry. The adult insects spread by flight over considerable distances and *O. caspius* in particular must be classed as a "migratory" species; it is sometimes responsible for complaints of a mosquito nuisance two miles or more from the marshes where it breeds. The measures required for controlling these species differ from the measures already described in that they invariably necessitate engineering works of ditching, filling, diking, tide-gating, pumping or other means of ensuring that the tide-water will be effectively kept out, or will be quickly run off or pumped away. The selection of the method and the manner in which it is to be carried out are questions which must be decided by a competent engineer after detailed study of the particular area to be dealt with. It is seldom or never useful to commence anti-larval operations until these permanent works have been satisfactorily completed. A useful account of the particular engineering problems connected with these works and the mode of dealing with them will be found in a book entitled "Mosquito Eradication," by W. E. Hardenburg, published by the McGraw-Hill Book Company, 6 and 8, Bouverie Street, London, E.C.4. In England, up to the present, the most successful application of these methods has been made at Hayling Island, Hampshire, through the agency of a voluntary organization directed by Mr. J. F. Marshall, M.A., F.E.S., of "Seacourt," Hayling Island, Hants. The organization, which is called the "Hayling Mosquito Control," has published three annual reports containing many valuable details of its work and results.

Reviews.

A SHORT KEY TO BOTH SEXES OF THE ANOPHELINE SPECIES OF INDIA, CEYLON AND MALAYA. By C. Strickland, M.A., B.Ch. Calcutta: Thacker, Spink and Co. Pp. 19. Price 3s.

"Men ful ofte ben slayn by bytynge of smalë flyës," says Chaucer in his translation of *De Consolacione Philosophie*, an opinion amply confirmed by modern science. Of such "smalë flyës," the Anophelini cause more hurt to mankind than all others added together, and an identification and study of the local *Anopheles* is a necessary preliminary in any intelligently conducted mosquito campaign. The brochure under review is a key to the known anopheline species of India, Ceylon and Malaya, and is arranged on somewhat novel lines. The reviewer was much impressed by the author's scheme of illustrating every character mentioned in the

key, for this precaution seemed likely to restrict the roving eye of faith. But the efficacy of any such diagnostic system is tested best by those who have a working acquaintance with mosquitoes, but whose interpretation of the text is unbiased by any exact knowledge of the species to be identified. Therefore, on three separate occasions classes under instruction were given specimens of *A. subpictus* and *A. stephensi*, and asked to determine the species by this key. With a single exception, every specimen was identified wrongly. As a control, the mosquitoes were then collected and redistributed, this time to be identified by Christophers' key. Without exception, every specimen was named correctly. Consequently the reviewer is unable to recommend Professor Strickland's key for the use of non-expert medical officers until its pitfalls have been guarded more securely, though its excellent plates and other figures would be found a helpful addition to the ordinary existing keys.

Some slips of the pen were noticed in the text: *fuliginosus* on p. 13 is misspelled; and on p. 17, the white band on the hind tibio-tarsal joint of *A. leucosphyrus* is described as on the femoro-tibial joint, although shown correctly in the corresponding plate. W. P. MacA.

THE EXTRA PHARMACOPŒIA, Volume II. Revised by W. Harrison Martindale, Ph.D., F.C.S., and W. Wynn Westcott, M.B., D.P.H. London: H. K. Lewis and Co., Ltd. Price 20s.

This is the second part of the eighteenth edition of Martindale and Westcott's book, the first volume of which was reviewed in these columns recently, and deals chiefly with analytical, experimental and research work. It covers a vast amount of ground, and includes information that rightly belongs to the first volume, and deserves early publication. Much is, of course, outside the field of work of a R.A.M.C. officer, though considerably more is of practical benefit to him in his duties, as the intention of the book is to keep the medical man well posted in recent advances and abreast of the times.

There is an interesting chapter on cocaine, in which the authors surmise that its condemnation as a medicine is in great measure merely fashion, and refer to the large doses used forty years ago without evil effects. Under the heading of Nutrimenta one finds much valuable information concerning vitamins, together with an important chapter on bread and flour control, and the personal view of the authors regarding the modern loaf. Radiology and radium take up many pages of the book, owing to the advances that have been made in apparatus, technique, diagnosis, therapy and protection during the past few years. Bacteriological notes contain much recent knowledge and clinical information concerning special diseases.

The book is valuable to the medical man, as it contains so much scientific information which is readily found. The authors have definite opinions and express themselves plainly. The vigour of their views helps in no small measure towards its utility, as the reader finds that he has a live book in his hands and not a mere compendium. M. B. H. R.

No. 2. February, 1926. Vol. XLVI.

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

LIEUTENANT-COLONEL A. E. HAMERTON, C.M.G., D.S.O., R.A.M.C.

ISSUED MONTHLY

IN ARDUIS FIDELIS

Printed and Published by
JOHN BALE, SONS & DANIELSSON, LTD.
83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

Price Two Shillings net.

VOL. XLVI. FEBRUARY, 1926. No. 2

Journal

of the

Royal Army Medical Corps.

Original Communications.

IMPORTANT FEATURES IN THE CORRECT DIAGNOSIS OF DYSENTERY IN INDIA.

(A preliminary note on ten months' experience of dysentery in Poona.)

BY MAJOR J. A. MANIFOLD, D.S.O.
Royal Army Medical Corps.

(1) "Of the 573 cases of dysentery, 479 were protozoal in origin, 16 bacillary, and the remainder were unclassified." (Report on the Health of the Army in India 1922.)

(2) "Of 318 cases of dysentery among British troops, 303 were protozoal in origin, 6 bacillary, 9 unclassified."

"Of 172 cases of dysentery among Indian Troops, 151 were protozoal in origin, 5 bacillary, unclassified 16." (Southern Command Statistics for 1923.)

(3) "Cunningham (1923) found 86 per cent of cases of dysentery in the jails of Eastern Bengal to be of bacillary origin, and that much the same proportion held for Moplah prisoners in the Madras Presidency."

"Our experience in Calcutta during the years 1920-23 is that bacillary dysentery is at least five or six times as common as is amœbic dysentery." (Acton and Knowles, *Indian Medical Gazette*, 1924, vol. lix, Nos. 7 and 9.)

THE above three quotations illustrate well the discrepancy which exists between military reports and the views of experienced civil workers regarding the incidence of bacillary and amœbic dysentery in India. Without correct diagnosis in these diseases correct treatment is impossible. The results of incorrect treatment mean permanent damage to the walls of the intestine, chronic ill-health and sometimes even death. It therefore seems to be urgently necessary to inquire into the position of affairs.

In addition, there exists, in the Poona District at least, a number of common intestinal disorders, ranging from cases of simple diarrhœa to those in which blood and mucus are passed for a few days. In not a few

cases these symptoms of mild intestinal disorder may be prolonged for weeks and even for months. These conditions are labelled "Poonaitis" by the laity, and diarrhœa, enteritis, catarrhal, colitis, etc., according to the predilections of the medical officer who happens to be called in to deal with them. In regard to their causation or classification there is at present very little knowledge based on correct scientific investigation.

Taking into consideration the fact that in ninety-nine per cent of cases the presence of blood and mucus in the stools, along with a certain train of symptoms, means one disease and only one, namely dysentery; that some of the diarrhœa cases have been found to be due to bacillus Flexner infections and some to organisms of the salmonella group, it is evident that these intestinal disorders are worthy of being sorted out into their various clinical entities.

On taking over the laboratory in Poona I accepted the current belief that, as our statistics have shown for many years, amœbic dysentery is the commonest type in India. Conversations with medical officers who had been many years in the country served to strengthen this opinion, and the summarized reports of the laboratory for the year 1924 appeared to clinch the matter.

Ten months' experience has entirely altered this impression. There is no question now that in Poona and its surroundings so far as the military population is concerned:—

(1) *Bacillary dysentery is an extremely common and widespread disease, far more so than amœbic dysentery.*

(2) Much of it is undiagnosed owing to a lack of laboratory investigation and to the usual mild nature of the intestinal disorders mentioned above.

The lack of specific diagnosis in the past has been due to a want of appreciation both on the part of the laboratory staffs and the medical officers in charge of these cases of the value of the microscopic examination of the stool in cases of bacillary dysentery, and to lack of knowledge regarding proper methods of collection and despatch of specimens to the laboratory.

I believe also that in other areas, where under the new conditions coming into force pathology specialists trained in protozoology and bacteriology are to work, results will probably be similar to those found existing in Poona, provided these officers work on proper lines, leave no technical work to subordinates, and instruct the medical officers in charge of the cases in proper methods of collecting and despatching samples.

Where medical officers not so trained are in charge of laboratories the results will probably be exactly the opposite and agree with the prevailing ideas on the subject.

The investigations of distinguished workers on these diseases in various parts of the East, including India, such as Wenyon [1], Acton [2], Knowles [2], Anderson [3], Cunningham [4], Manson-Bahr [5], and many others, represent the true state of affairs and our statistics for Poona and probably for other areas do not.

Funds have now been obtained, and it is hoped during the next twelve months to investigate this question fully throughout the Poona District. The results obtained at present are comparatively few in number, owing to difficulties early in the year such as lack of trained staff, insufficiency of apparatus and material, and lack of knowledge on the subject generally among medical officers. There is also some prejudice against casting doubt on published statistics of the past. On the other hand one has had every help from the Assistant Director of Hygiene and Pathology, Southern Command, the D.D.M.S., Southern Command, and the Director of Hygiene and Pathology at Army Headquarters, who have been aware for some time of the present confusion. So much is this appreciated that when statistics of different localities are compared, all these intestinal disorders are grouped under one heading, and little value is placed on actual diagnosis.

CERTAIN WIDESPREAD MISAPPREHENSIONS EXIST AT PRESENT on this subject which the writer mentions only to expose.

(1) Dysentery is an ugly word and looks bad on paper. Diarrhœa, colitis, etc., are more or less respectable and do not indicate insanitary conditions to such an extent as the former.

(2) Blood, mucus, tenesmus, colic, etc., of only two or three days' duration, do not necessarily indicate dysentery. What they do indicate is not quite certain. Diarrhœa is a useful name for the condition, and a little emetine often works wonders. On the writer insisting that these symptoms as a practical proposition mean dysentery, and with a certain cellular exudate only bacillary dysentery, he was told that possibly the condition might be "carcinoma of the rectum or suppurating piles!" Again, blood and mucus in the stools of such cases is considered to be due to malarial infections by some clinicians. A consideration of the pathological condition of the bowel wall in the two conditions should be sufficient to avoid this error. In cases of malaria suffering from a heavy *Plasmodium falciparum* infection only, I have seen hæmorrhage from the bowel, but never an inflammatory exudate such as occurs in bacillary dysentery. On the other hand I have seen in East Africa many cases in which an attack of bacillary dysentery was superimposed on a previous malarial infection. Undoubtedly these cases are met with in India also.

(3) Ninety-nine per cent of dysenteries sufficiently severe to be diagnosed as such are considered amœbic in origin. Most diarrhœas are also amœbic in origin. The laboratory diagnosis is hardly worth waiting for before commencing emetine treatment. Emetine is the specific for intestinal troubles. Its toxic action is negligible or only of academic interest. Often it is administered much in the spirit of "when in doubt lead trumps." The writer has been assured that in cases of true bacillary dysentery emetine in small doses gives excellent results." "It soothes the bowel." Possibly this is so. It is a subject on which I cannot speak with experience, but both bowel and patient with an undiagnosed Shiga infection might be soothed for ever.

(4) The pathological condition of the intestine in bacillary dysentery is largely of moment only to the pathological specialist, and anyhow is not very serious.

In addition there is little general knowledge among medical officers, and indeed in some laboratories, of the importance of macroscopic appearance of the stool and the microscopic appearance of the cellular exudate in bacillary dysentery. The literature on this subject has been so extensive for years that this seems impossible. But it is so, and the writer has had to argue and plead for what has been an accepted scientific fact for many years. This lack of knowledge has been appreciated by the Medical Directorate, and a reprint of the most excellent articles of Acton and Knowles on the "Dysenteries of India" has been issued to all hospitals. A few medical officers whom the writer has met appear to have read it.

The figures from January 1 to August, 1925, are taken from my own laboratory reports. The laboratory reports for the first ten months only of 1924 are given by way of contrast as I took over the laboratory in early November of that year. The findings are purely laboratory findings, and no attempt has been made to collect hospital returns as in the early part of the year dysentery cases were not, unless severe, diagnosed dysentery in many cases unless the actual causative organism had been isolated.

The figures of the ten months in 1924 are approximately correct as regards the number of cases. There may be a slight error in the number, but it is not serious. Eighty-four cases of amœbic dysentery were diagnosed. Eight cases were bacillary in type and from these bacillus Shiga was isolated. All these bacillary cases occurred together in a short space of time and were looked on as a mild epidemic. Bacillus Flexner was not isolated during this period, and there are no reports available indicating any particular type of cellular exudate being found in the stool.

From January 1 *to August* 31, 1925 (eight months) 117 cases have been reported as showing typical bacillary exudate under the microscope. From these stools bacillus Flexner was isolated in forty-three cases, bacillus Shiga in fifteen. In addition some organisms morphologically and by sugar reactions identical with the Flexner group have been isolated, but not proved serologically. These, therefore, were not reported as such and some of them are still under investigation. The reasons for the small percentage of actual recovery of the infecting organism are gone into later. It may be mentioned here, that in the month of August there were twenty-three laboratory reports given on cases of typical bacillary exudates and from twenty of these cases either bacillus Shiga or bacillus Flexner was isolated.

RESULTS TABULATED.

1924 (10 months)		1925 (8 months)	
Amœbic dysentery	84	Amœbic dysentery	12
Bacillary dysentery	8	Bacillary dysentery	117
(Bacillus Flexner ..	*Nil*)	(Bacillus Flexner ..	43)
(Bacillus Shiga	8)	(Bacillus Shiga	15)
		(? Flexner group .. (inagglutinable)	8)

The above figures appear to be in such striking contrast that one felt some explanation must be found. Obviously a disease endemic for a long period in a locality cannot suddenly change into another entirely different in its causation. That the diagnosis of the 117 cases reported on as bacillary dysentery was correct, is proved by the fact that they were treated as such, i.e., antidysenteric serum plus salines for the severe cases, and salines only for the mild cases. Emetine was not administered, and the cases reacted to treatment and quickly recovered. Also there was no question of an epidemic. The cases occurred sporadically in all parts of the cantonment, and followed closely the seasonal incidence found to exist in former years for the so-called amœbic dysentery.

On carefully scrutinizing the laboratory reports for previous years, not only in the period referred to in 1924, I believe I can trace the source of the heavy incidence of amœbic dysentery. This I think can be found in the following reports on what, as far as I can see, were specimens containing blood and mucus from acute cases of dysentery. Reports on examinations for the presence of cysts in possible carriers of *Entamœba histolytica* are not considered, nor are the latter included in the figures quoted above.

The reports referred to are as follows :—

(1) *E. histolytica* and cysts present.

(2) Precystic form of *E. histolytica* present.

(3) Dead amœba histolytica present.

(4) Cysts of *E. histolytica* present.

I believe that many of the so-called *E. histolytica* referred to in these reports are the macrophage endothelial cells seen constantly in cases of bacillary dysentery. These cells are either the large hyaline cell as seen in the blood, or detached endothelial cells from the capillaries. They are large clear cells similar in size to an amœba with a rounded or oval refractile nucleus, often containing greenish refractile fatty particles, which may easily be mistaken for red blood-corpuscles, and these cells very often actually contain phagocyted red blood-corpuscles. For all practical purposes they are non-motile, though as they can phagocyte red blood-corpuscles it is possible one might see some slight change of shape. By numerous writers in the past the danger of mistaking this cell for an amœba has been pointed out.

The reasons for believing that in the past this error has been the cause of the high figure of amœbic dysentery in Poona are discussed under the various types of cells referred to in the reports.

(1) Entamœba histolytica *and Cysts present.*—The presence of vegetative forms of *E. histolytica* and its cystic forms together in the blood and mucus of a case suffering for the first time from acute amœbic dysentery is presumably impossible. In the case of a "carrier" relapsing into acute attack, if the fæces were examined at the correct moment, it is possible that both forms might be found together. Wenyon [1] records

one such case in his treatise on human intestinal protozoa in the Near East. In this case cysts and amœbæ of the minute type were found in the fæcal portion of the stool, and vegetative amœbæ were found in the mucus. Again in an *E. histolytica* carrier suffering from an attack of bacillary dysentery cysts and precystic amœbæ might be found together in fæcal matter in the very early stages before they had been flushed out of the bowel during the purging process. The above, however, are pathological curiosities, and though they may occur can only be rarely seen in the laboratory. IN CHRONIC CASES of dysentery of course all forms of *E. histolytica* may be found together, and in the semi-solid stool of the recovering case and the nonacute stage of an *E. histolytica* carrier precystic amœbæ and cysts may be found together.

The reports referred to above must be mainly on acute cases containing blood and mucus—and not on carriers or chronic cases. In my experience the "chronic dysentery" case must be comparatively rarely seen among the European military population presumably because such a case is invalided, and sent to England before his condition has reached this stage, nor have I seen such a case among the Indian troops in Poona during the period under review. A few persistent carriers who have relapsed two or three times have been met with. Also most cases report sick some time after the commencement of their attack, and cysts, precystic forms of amœbæ, etc., have disappeared, before their stools can be examined.

I cannot help feeling therefore that many of the so-called *E. histolytica* were really endothelial cells with included red cells, and the cysts were probably degenerated polymorphonuclear cells, etc.

(2) *Precystic forms of* E. histolytica *present.*—These as stated above are most unlikely to be met with in the stool of acute dysentery at the time the specimen is seen in the laboratory, and if they are seen by chance they CANNOT BE DISTINGUISHED from the similar stage of *Entamœba coli.* This is agreed to by all protozoologists. It is probable, therefore, that such cells were endothelial cells without included red blood-corpuscles.

(3) *Dead* E. histolytica *present.*—A specific identification of a dead amœba is difficult even for the most expert protozoologist, and if it is degenerated, as would almost certainly be the case, is an impossibility. Films stained by the iron hæmatoxylin method at an early stage of degeneration might possibly lead to a specific diagnosis, but I am certain this method was not employed. Here again we have the non-motile endothelial cell. In fact I was shown on several occasions one of these cells with red cells included, as a dead amœba by an assistant surgeon of long experience in laboratories in India.

(4) *Cysts of* E. histolytica *present.*—Here again these cysts were seen in apparently acute cases. Their extreme rarity in such cases has been pointed out above, and I feel that some of them must have been degenerated polymorphonuclear cells, etc. Lastly I could find no evidence of any reports on the cytological examinations of specimens of mucus from cases of dysentery,

and medical officers, not being accustomed to these reports, at first did not realize their importance from a diagnostic or treatment point of view.

Many writers have laid down that the presence of red blood corpuscles in an amœba should be taken as a standard for a specific diagnosis of *E. histolytica.* I would point out that this is insufficient unless one has been trained for a long period to recognize what really is an amœba. If in acute cases of dysentery an ACTIVELY MOTILE CELL CONTAINING RED BLOOD-CORPUSCLES was accepted as an *E. histolytica*, and no non-motile object regarded as such, the cases of amœbic dysentery would probably rapidly diminish in number, as has been the case here in Poona.

These erroneous findings, plus the important fact that the majority of the bacillary dysentery cases are mild in nature, being due to bacillus Flexner, and clear up in five or six days with treatment by salines, or oleum ricini, have given rise to the misapprehension among the majority of the medical profession (not only military medical officers) in this country that amœbic dysentery is almost universal. The writings of Knowles [2], Acton [2], Cunningham [4], etc., have not been appreciated to any general extent by general practitioners. Civil medical practitioners tell me that they see many cases of dysentery, and practically all are amœbic in origin. On inquiring why they think so, the inevitable answer is given that the cases usually clear up in three or four days with emetine treatment. Invariably salines or oleum ricini is given as well. There is also little knowledge of the value of early microscopic examinations.

It is hoped to investigate the prevailing type of dysentery among the civil population shortly, but it is unlikely that the military element would suffer mainly from one type of the disease and the civil element from another.

The percentage of bacillus Shiga infections is luckily small, 12·8 per cent among the bacillary exudates dealt with. If indefinite exudates were included, the percentage would be very much smaller. Many, however, are sufficiently severe to indicate that the toxic action of emetine on the heart, plus dysentery toxin, may lead to disastrous results, and disasters undoubtedly have occurred in the past. Incidentally some very severe cases of dysentery caused by bacillus Flexner have been encountered.

The following incidents illustrate the haphazard method in which emetine is often given and the dislike of the term dysentery that exists when the condition is mild.

(1) Case with history of previous attack of pericarditis, with enlarged heart, enlarged liver, crepitations at bases of both lungs, œdema of legs, great dyspnœa. On account of the enlarged liver, diagnosis was evidently "probable amœbic hepatitis," so emetine injections one grain daily were administered. Final result death. One cannot say that death was due to the emetine injections, but the effect on the myocardium, already in a condition of probable chronic interstitial myocarditis, cannot have been beneficial.

(2) Case of a civilian with a history of continuous fever for some months and intermittent diarrhœa. Treatment: innumerable courses of emetine, plus at intervals quinine intramuscular injections. The liver in this case progressively enlarged until it became of enormous size and the patient steadily wasted away. Finally a stool was sent to the laboratory, and *Bacillus typhosus* was isolated. All emetine treatment was forbidden and treatment on general lines only carried out. The liver gradually returned to its normal size. The patient rapidly put on flesh, and apart from being a chronic typhoid carrier, apparently is now well again. The physician who looked after this patient, and put a stop to the emetine treatment has no doubt that the case was one of emetine poisoning. He informed me that when he first saw him, the patient had been injected with one grain of emetine daily for four months.

(3) Several cases are encountered suffering from so-called colitis, some with histories of dysentery in the past, and all with previous history of diarrhœa. When seen they state they pass a little mucus in the stool at intervals, and suffer from slight abdominal discomfort. Sometimes, also, they have a slight rise of temperature. All have had courses of emetine, and from quite a number, when the mucus alone was examined, bacillus Flexner has been isolated in almost pure culture, in one case bacillus Shiga. Some of the bacillus Flexner cases are undergoing vaccine treatment, the results of which are still uncertain.

The prevailing view in connection with the mild type of Flexner dysentery is well illustrated by the following comments on a case with a history of passing blood and mucus for a few days.

" This case is undoubtedly a case of mild colitis. Although the laboratory report states bacillus Flexner was isolated, this is purely a laboratory finding."

This attitude was not so very uncommon, though it is becoming less so now in the Poona District at any rate. Sufficient time has now elapsed and sufficient cases have been treated by salines or serum to permit medical officers to see that these cases recover without being inflicted with emetine injections and that the disasters predicted and imagined have not occurred.

Passing to one's own findings, one feels that the percentage of actual isolation and serological identification of the infective bacilli is far too small, probably when all are investigated about sixty per cent. The reasons for this are numerous, but the most important undoubtedly are:—

(1) The majority of the cases were mild in nature. As a result the patients did not report sick and were often not admitted to hospital until the third or fourth day of the disease.

(2) Earlier in the year medical officers did not appreciate the necessity of speed in dispatching samples to the laboratory after passage of the stool, nor of sending samples collected early in the case.

(3) Fæces were often intimately mixed with the mucus in a test-tube before dispatching the specimen to the laboratory, and as several hours

and sometimes days elapsed before its arrival the recovery of the infecting organism was hopeless. Some specimens even proved to be sterile and it was found they had been collected in receptacles containing cresol.

(4) Owing to the shortage of Petri dishes, plates of media had often to be used when still wet with water of condensation, rather than allow the specimen to remain longer unplated. As a result discrete colonies were not obtained. Also from the same cause plates could not be returned to the incubator after examination for a further twenty-four hours' incubation and re-examination.

(5) Owing to the lack of training of the laboratory staff and defective media, sugar reactions were often doubtful and cultures were contaminated and lost.

(6) The inagglutinability of recently isolated cultures of bacillus Flexner was at first not appreciated. Cultures were thrown out after two subcultures. Later experience has proved the necessity of much more frequent subculturing before deciding that serologically they do not belong to the Flexner group. Also for some time efficient polyvalent Flexner agglutinating serum was not available.

The majority of these difficulties have now been overcome and in the month of August, as stated above, twenty-three typical bacillary dysentery exudates were sent to the laboratory, and from twenty of these either bacillus Shiga or bacillus Flexner was isolated.

Faulty collection, and lack of speedy dispatch of the samples from hospitals for examination in the laboratory, were undoubtedly the main sources of negative results. This important matter was almost always in the past left to ignorant subordinates, as being of little moment. Various methods were tried to overcome this fixed custom, which need not be gone into, until finally the D.D.M.S., Southern Command, issued the instructions found at the end of these notes to all medical officers in the Command, since when the laboratory results have been much better. Officers in charge of hospitals and medical officers in charge of cases now assist in every way. The lack of co-ordination formerly existing between physician and laboratory worker was very striking, largely due to the fact that the uselessness of samples collected and sent anyhow to the laboratory was not sufficiently pointed out to the medical officers concerned.

The following methods adopted by the writer in dealing with these cases may be of use to his brother Deputy Assistant Directors of Pathology.

(1) Medical officers are requested to write on the report the hour at which the stool was passed. If this is omitted, the fact is pointed out when sending the report on the sample, and a statement is added that the negative result was probably due to delay in transmission.

(2) When possible the entire bed-pan is brought to the laboratory and the specimen dealt with at once. Where this is impossible, as with specimens from hospitals a few miles from the laboratory, a specimen of fresh mucus only is forwarded in one test-tube, and another portion of

mucus in the glycerine and saline solution mentioned in the instructions. Both specimens are plated out. From long distances films of mucus are also sent on slides for staining.

If fæces are sent mixed with the mucus, the medical officer is again informed that he is probably responsible for the negative result, and not the laboratory, unless a note has been added to his report stating that the separation of mucus was impossible.

(3) On receipt of the sample, a specimen of the mucus is at once plated out and then examined microscopically. The bearer of the specimen is then handed a report stating: (*a*) that the cellular exudate of the case is that of typical bacillary dysentery; or (*b*) that the patient is suffering from dysentery, but that the microscopic picture of the exudate cannot definitely be said to be that of typical bacillary dysentery, a request is added that another specimen may be sent as soon as possible; or (*c*) that entamœbæ *histolytica* are present. This advance report has proved of great value in enabling medical officers to commence at an early date injections of anti-dysentery serum in severe cases.

As regards laboratory technique. The method employed throughout has been identical with that taught by Lieutenant-Colonel H. Marrian Perry at the Royal Army Medical College. Test-tubes of sterile saline are kept ready and inoculated with the mucus, and then plated out on bile salt litmus lactose agar. On the next day likely colonies are looked for. In my experience colonies of dysentery group bacilli vary in size from very small streptococcal-like colonies up to colonies of quite a fair size. The former are indistinguishable on a plate from streptococci, and from *Bacillus fæcalis alkaligenes*, bacillus Morgan, etc. It has thus been found better to carry out a series of hanging-drop examinations of such colonies, and only the colonies of non-motile bacilli are picked off. If these examinations are done according to Colonel Perry's method (i.e., grease pencil line on cover slip and $\frac{1}{6}$ lens) very little time is needed for examining eight to nine colonies. The same hollow-ground slide is used throughout, and only fresh cover-slips are taken.

Five colonies of non-motile bacilli if possible are picked off each plate into lactose peptone salt solution containing Andrade's indicator, and examined next day for motility and reaction and then inoculated into glucose, mannite and dulcite. Latterly it has been found more useful to inoculate the colonies direct into glucose and mannite sugar media, and then those fermenting glucose only, or glucose and mannite, are inoculated from these tubes into lactose and dulcite, and into peptone salt for indol test, and broth for agglutination test.

Organisms giving the reaction of the Flexner group are then put up against polyvalent Flexner serum, and those of bacillus Shiga against Shiga serum.

A fact not sufficiently appreciated by the writer at first was the inagglutinability of freshly isolated strains of bacillus Flexner. Repeated subcultures have to be made before some organisms will agglutinate. This

fact has been noted by all workers on the subject, but the extent was not realized at first, and cultures were lost. A difficulty here arises on the part of the medical officer who is waiting to send in his A. F. A. 35 on the case to the A.D.M.S., and also on the part of others who feel that unless they are told that a definite bacillus has been isolated, the case cannot be one of bacillary dysentery. I have found that a report stating that "a bacillus giving the biochemical reactions of bacillus Flexner has been isolated, and that serological results will be reported later," meets the case. Incidentally D.A.D.P.s have access now to all A 35s in the A.D.M.S. office, and the serological results could be entered at a later date. The Shiga bacilli isolated have not given trouble to the same extent.

Plates from dysentery cases are now always returned to the incubator for a further twenty-four hours in view of a possible negative result on the first day, and this also has led to an increase in the positive results.

Great difficulty was experienced during the monsoon in obtaining dry plates. It was found that if dried by the usual method in the incubator, they were either not ready for use when required, or were contaminated. This difficulty was overcome by a useful suggestion of Assistant Surgeon A. J. de Monte, which I can recommend to others. A "tray dinner" (that is the tray with a double bottom issued to hospitals for keeping food warm) is procured, which holds eighteen to twenty plates; boiling water is poured into the compartment at the bottom of the tray, and raises the temperature inside to about 40° C. The plates are allowed to set before the hot water is poured in. The tray is wiped daily with cresol, and once a week sterilized by flaming with spirit. In it the plates can be left open and face upward with impunity from contaminations, and are thoroughly dried and ready for use in two hours time.

By far the larger number of bacillary dysenteries in Poona are probably due to organisms of the Flexner group. The actual strains responsible have not been worked out yet. This will be done when a sufficient number is collected. Various allied organisms have been found in small numbers, i.e., some possibly bacillus Flexner, some possibly Sonne's bacillus, some corresponding to the Kruse E type, and some bacillus Flexner apparently inagglutinable entirely by polyvalent Flexner serum. The toxicity of the strains and their serological relationship to the cases remain to be worked out, but these are probably of not much importance. One fact which has struck the writer forcibly in this connexion is that the earlier in the case a specimen is sent, and the more care is used in collection and dispatch of the sample and in the technique used in dealing with it in the laboratory, the less frequently these doubtful organisms seem to crop up.

The dysentery cases are restricted to no particular unit or area and can be traced to no known cause. From an average number of 8 typical bacillary exudates per month from new cases for the first five months of the year, there was a sudden jump in June to 24 cases, in July to 35 cases, and in August to 23 cases. It was noticed that flies began to become a nuisance at approximately the same period. But this is a matter which

it is hoped to go into carefully at a later date. It has been impossible to carry out further investigations during the past year.

The routine examination for carriers of organisms of the dysentery group among menials handling food has been a complete failure. Carriers must exist among the native population in large numbers, and with probably the assistance of flies, are almost certainly the cause of the endemic nature and widespread distribution of the disease in the cantonment. It must, therefore, be the technique of the examination that is at fault. In my experience when mucus is present in the stools dysentery organisms are easily isolated, if the mucus is dealt with quickly. Where only fæces are present then isolation is almost impossible. Even in the late periods of an acute attack, once the mucus has disappeared from the stool dysentery bacilli have seldom been recovered during the routine examinations. I believe, therefore, that macroscopic examinations of these menials' stools would have to be carried out over long periods, and if mucus was found at any time to be present, stools should then be sent to the laboratory. In actual practice such a method applied to servants in cantonments would be impossible, and therefore the detection of carriers of dysentery bacilli among the servant class in cantonments is largely impracticable, with our present knowledge.

Furthermore precise work on the subject of the dysenteries of this district, and also on the prevalent diarrhœa, will be undertaken during the next twelve months in conjunction with other medical officers.

These notes are merely of a preliminary nature and are written because in this district there appears to have been a misconception in past years of the prevalent type of dysentery and, as a corollary, emetine has been magnified into a panacea for all intestinal troubles.

Many comparatively newly-trained pathology specialists are now gradually taking over military laboratories in India, and it is felt that a useful purpose may be served if the difficulties encountered, and also the efforts made to overcome them, are brought to notice. Incidentally also we are at the beginning of laboratory reorganization in this country, and the writer's experiences in connexion with the dysentery group in Poona may act as a warning to his brother pathologists against taking the results of the past for granted, and leaving details of important technique to subordinates untrained in modern methods.

Summary of Conclusions.

(1) In Poona, at least among the military population, bacillary dysentery, usually mild, is much more prevalent than amœbic dysentery. This finding agrees with the findings of Majors Acton and Knowles, and of Major Cunningham working in other parts of India.

(2) The paucity of bacillary cases recorded in the past is due to: (*a*) Many bacillary cases having been erroneously diagnosed as amœbic in origin. (*b*) Owing to the mildness of the symptoms of the cases, many having been diagnosed diarrhœa, colitis, etc., in lieu of dysentery.

(3) THE CAUSE OF THESE ERRORS has been: (*a*) Lack of recognition of the character and importance of the cellular exudate in bacillary dysentery, and the diagnosis of macrophage endothelial cells containing red blood-corpuscles as *E. histolytica*. (*b*) Lack of co-operation between medical officers in charge of cases and laboratories.

(4) THE RESULT OF THESE ERRORS is that medical officers have believed most intestinal disorders to be due to infection by *E. histolytica*, and emetine has thus become an unnecessarily prominent feature in the treatment of these disorders.

(5) THE REMEDY CAN BE OBTAINED: (*a*) By increased co-operation between clinicians and the laboratory. (*b*) By the D.A.D.P. instructing medical officers in the preliminary precautions that are necessary to establish a correct diagnosis. (*c*) By laboratory workers without recent training (and even those with training only after a large experience) not accepting a cell as *E. histolytica* in the blood and mucus from a case of *acute dysentery* unless it contains red cells and is actively motile. (If non-motile, a worker with large experience might make a specific diagnosis after employing Heidenhain's iron hæmatoxylin stain, not otherwise.) (*d*) By the D.A.D.P. accepting no diagnosis from a subordinate until he has confirmed it himself.

In conclusion I must thank Lieutenant-Colonel H. Marrian Perry for sending me agglutinating serum, cultures, etc., at the commencement of this work, and also for much good advice. In fact the work on which these notes are written is merely an attempt at the practical application of his teachings.

I have also to thank Captain Pottinger, M.C., R.A.M.C., and Captain Aitchison, M.C., I.M.S., from whom most of the specimens were received for their co-operation, and for diagnosing and treating these cases in accordance with laboratory findings—a matter not too easy in the light of the preconceived ideas existing on this subject. Also I would thank them for the trouble they have taken in endeavouring to ensure that the specimens were sent to the laboratory in proper manner, a matter of surprising difficulty in this country.

Finally, I have to thank Major-General Collins, C.B., C.M.G., K.H.S., for permission to publish the instructions for the collection and dispatch of specimens, etc., which he caused to be issued throughout the command, as an appendix to these notes.

REFERENCES.

[1] WENYON, C. M., and O'CONNOR, F. W. (1917). "Human Intestinal Protozoa in the Near East."

[2] ACTON and KNOWLES. *Indian Med. Gaz.*, 1924, lix, Nos. 7 and 9.

[3] ANDERSON, J. (1921). "A Study of Dysentery in the Field," *Lancet*, November 12, 1921, p. 998.

[4] CUNNINGHAM, J. (1923). "Some Observations on Dysentery," *Indian Med. Gaz.*, lviii, No. 8, p. 358.

[5] MANSON-BAHR, P. H., PERRY, H. M., and MANSON, the late Sir PATRICK (1922). Byam and Archibald's "Practice of Medicine in the Tropics," p. 1108.

[6] Medical Research Council, Special Report Series, No. 51.

APPENDIX.

NOTES ON BACTERIOLOGICAL DIAGNOSIS AND DIRECTIONS FOR THE COLLECTION AND DISPATCH OF THE MATERIAL FOR EXAMINATION.

From analysis of the figures of the past year it has become apparent :—

(1) That many cases of mild but true dysentery have been included under diagnostic headings such as "Colitis" "Enteritis" and "Diarrhœa."

(2) That confusion exists between the differential diagnosis of bacillary and amœbic dysentery. As a result an undue number of cases have been diagnosed amœbic dysentery. Some of these have later been found to become cases of chronic dysentery and from these bacillus Flexner or bacillus Shiga has been isolated.

(3) That there are a number of fevers of short duration the correct diagnosis of which might have been obtained if blood-cultures had been taken sufficiently early, and with the proper precautions to avoid contaminations.

(4) That specimens have been sent to district laboratories for examination without special precautions being taken to counteract the effects of temperature, and delay in transit.

(5) Samples of stools from dysentery cases are forwarded to the laboratory without regard to the selection of the particular portions which are of service as regards laboratory diagnosis.

(6) The diagnosis of many tropical diseases is often an impossibility unless the closest co-operation exists between the medical officer in charge of the case and the medical officer in charge of the laboratory. Medical officers are therefore requested to pay particular attention to the method of collection and forwarding of samples to the laboratory as detailed below ; without this personal attention to detail on the part of the medical officer in charge of the case a correct diagnosis from the laboratory becomes impossible.

(7) Post-mortem reports are not sufficiently full, and sufficient use has not been made of the laboratory, as regards the microscopic examination of diseased tissues. Portions of diseased tissues should be sent in all cases to the laboratory for microscopic examination and report.

(8) Similarly new growths, or diseased tissues removed at operations, should likewise be forwarded to the laboratory for a report on the pathological appearances.

With reference to the diagnosis of the dysentery group of diseases certain points may be noted which are of assistance to the medical officer when sending samples to the laboratory.

Bacillary Dysentery: (I) Typical Case.

After a preliminary diarrhœa for a short period, frequent and characteristic stools are passed. Pain and tenesmus during the passage of the stool are marked features; often also the temperature is raised.

Character of Stool.

When the disease is established the stool consists almost entirely of mucus, often streaked with bright red blood, viscous, adherent to the bed-pan, and without odour. If tested with litmus paper as soon as it is passed it is alkaline in reaction.

Fæces are as a rule absent or only present in a small amount.

In such a case microscopic examination of the mucus by a pathologist is of the greatest diagnostic significance and a preliminary report of the result of this examination should be forwarded at once by the district Deputy Assistant Director of Pathology or officer in charge brigade laboratory to the medical officer in charge of the case.

Cases vary between a mild type in which fæces may be found along with the mucus, usually due to an infection by bacillus Flexner and a very acute toxic type usually due to an infection by bacillus Shiga.

Points Regarding Bacteriological Diagnosis.

(*a*) Organisms of the dysentery group are recovered with difficulty from the stools except in the early stages of the disease; therefore samples of the stool should be sent to the laboratory as soon as possible after the patient has come under observation.

(*b*) Organisms of the dysentery group are usually found in the mucus and are easily overgrown and destroyed by other organisms, therefore samples sent to the laboratory should be as free from fæcal matter as possible, and consist only of portions of mucus.

(*c*) Organisms of the dysentery group rapidly die after the passage of the stool. In this country their death is even more rapid owing to the high temperature of the external air; therefore in cases in which more than two hours must elapse between the passage of the stool and its arrival in the laboratory, solutions must be made use of which prevent the growth of bacilli other than those of the dysentery group (see methods detailed below). The mucus, therefore, in such cases should be placed in the solution as soon as possible after it is passed.

(*d*) Medical officers should invariably themselves examine the entire stool in the bed-pan and themselves select the portion which is to be sent for bacteriological examination.

(*e*) Instructions should be given to subordinates that all cases suspected of suffering from dysentery should be given a clean dry bed-pan free from antiseptics and that patients should be instructed to pass their urine first into another receptacle in order that no urine can be mixed with the stool.

(*f*) As long as mucus is present in the stool a sample should be sent daily to the laboratory until the laboratory report has been received indicating the nature of the infective organism.

Amœbic Dysentery.

In this condition there is, as a rule, less pain and tenesmus than in the bacillary type of dysentery. The stools are usually also fewer in number and the patient not so acutely ill. Blood, dark in colour, and mucus, are often intimately mingled with fæces. The stool is often offensive and may resemble that of a case of diarrhœa. When freshly passed it is usually acid in reaction. If a portion of the mucus be examined under a microscope directly the stool has been passed, motile *E. histolytica* containing red cells may be found. Cysts of *E. histolytica* are not present in the stools during an attack of dysentery. Medical officers are cautioned against diagnosing specific amœbæ and cysts unless they have had special training and considerable experience.

Points regarding Laboratory Diagnosis of *E. histolytica*.

(1) The amœbæ in the stool commence degenerating as soon as the stool has been passed. Within one hour they are often unrecognizable without special staining methods and then with difficulty. Therefore in stations distant from the laboratory, the laboratory diagnosis can only be carried out—

(*a*) On the nature of the cellular exudate present in the mucus ; (*b*) on the presence or absence of *E. histolytica* in stained films of the mucus.

Attention is therefore drawn to the methods of fixing and forwarding of such films of mucus to the laboratory.

(2) Vegetative *E. histolytica* are present in the mucus in cases of acute, subacute and chronic dysentery, but in the latter are not as evenly distributed throughout the mucus as in the acute form. Particular care should therefore be taken in these cases to select blood-stained portions of mucus, or small sloughs of mucous membrane which are often present, for examination, as in these amœbæ are more likely to be present.

(3) In amœbic diarrhœa (i.e., diarrhœa due to infection by *E. histolytica*, but without blood and mucus being present in stools) precystic forms of *E. histolytica* largely predominate. These can only be differentiated with the greatest difficulty, if at all, from precystic forms of *Entamœba coli*. After a preliminary report from the laboratory that such precystic amœbæ are present, purgatives should be strictly avoided and a solid portion of the stool sent for laboratory examination in the manner described later as for examination for cysts, when the diagnosis will be established by the discovery of the specific cysts.

(4) Films of mucus on cover slips or slides should be made in the manner detailed below as soon as possible after the passage of the stool and in all cases by, or under the supervision of, the medical officer in charge of the case.

(5) *E. histolytica* cysts are only found as a rule in solid fæces, often in small particles of mucus on the outer surface. These portions should

therefore be selected for transmission to the laboratory and thoroughly emulsified in iodine solution detailed below.

(6) Instructions to subordinates as regards the use of a clean dry bedpan by patients and the absence of urine from the fæces are even more important than in the case of bacillary dysentery. Urine destroys *E. histolytica* and renders it unrecognizable almost at once.

Diarrhœic Conditions.

As it is possible that many of these conditions are due to a mild infection by bacillus Flexner or organisms of the food poisoning group it is desirable that stools after passage should be emulsified without delay in glycerine saline solution and forwarded to the laboratory.

Should amœbic diarrhœa be suspected, three films of fæces should be fixed and dispatched to the laboratory as in cases of suspected amœbic dysentery. (For methods see later.) At the same time a sample of fæces should be emulsified in iodine solution as for examination for cysts and forwarded to the laboratory.

Pyrexial Cases without Localizing Signs.

The attention of medical officers is drawn to the procedure as laid down in D.M.S. in India, circular No. 26-S, dated September 10, 1920.

The methods to be employed in the collection and forwarding of samples of stools from cases of dysentery to the laboratory :—

Three Essentials to be Carried Out.

(1) A specimen should be collected as early in the course of the disease as possible, i.e., at the earliest opportunity after ascertaining that blood or mucus is present in the stools.

(2) The specimen must be dealt with as described below directly after passage of the stool. The longer the delay the less chance there is of a diagnosis being established.

(3) Specimen must be collected in a clean dry bed-pan without antiseptic or admixture with urine.

Procedure to be Adopted with all Dysentery Stools.

(1) Test reaction of mucus with litmus paper and report the result to the laboratory when sending sample.

(2) Spread some mucus on a clean slide, allow it to dry and forward it to the laboratory. (If a little mucus is picked up with the litmus paper and gently drawn over the slide a good film can be obtained. If pressure is used in making the film the cells are broken down and unrecognizable when stained.)

(3) Transfer as soon as possible portions of mucus as free from fæces as possible into a solution in a sterile test-tube of thirty per cent neutral glycerine in 0·6 per cent saline. (Glycerine must not be acid in reaction).

APPLICABLE TO CASES OF SUSPECTED AMŒBIC DYSENTERY.

(4) A portion of mucus as free from fæces as possible should be picked up and spread on three coverslips or slides. Before the film dries the coverslips or slides should be dropped into Schaudinn's solution and left in the solution for fifteen minutes. They should then be transferred to a bottle containing seventy per cent alcohol with a little cotton wool on the bottom of the bottle to avoid breakage and forwarded to the laboratory. The bottle and alcohol will be returned from the laboratory with the report on the specimen.

SCHAUDINN'S SOLUTION.

Saturated solution of mercuric chloride in normal saline ..	2 parts
Absolute alcohol	1 part
Glacial acetic acid..	3 to 5 per cent.

SUMMARY.

Forward to the laboratory in suspected cases of dysentery :—

(1) Reaction of stool to litmus paper.
(2) Film of mucus for examination of cellular exudate.
(3) Sample of mucus in glycerine saline solution.

WHERE AMŒBIC DYSENTERY SUSPECTED.

In addition to above send three films of mucus in seventy per cent alcohol after fixation in Schaudinn's solution.

On the report from the medical officer should be written a short clinical history including a description of the entire stool and the time elapsing between passage of stool and the immersion of its mucus in the glycerine solution or fixation of the films in Schaudinn's solution.

Transmision of Fæces for Examination of cysts of E. histolytica.

A solid portion of the stool should be chosen, particularly outer portions with adherent mucus. These should be thoroughly emulsified in a solution of iodine 1 part, potassium iodide 2 parts, and water to 100 cubic centimetres.

Transmission of Fæces from Cases of Suspected Amœbic Diarrhœa.

Portions of fæces (and vomited material if available) should be emulsified in the glycerine and saline solution and forwarded to the laboratory as for the enteric group bacilli.

Should amœbic diarrhœa be suspected, three films of fæces should be fixed and forwarded to the laboratory, as described above for the mucus in cases of amœbic dysentery. At the same time a sample of the fæces should be treated in the manner described for cysts of amœbæ, and forwarded along with the films.

VENEREAL PROPHYLAXIS: ITS MEANING AND EFFECTS.[1]

By Lieut.-Colonel P. HOPE FALKNER.

Royal Army Medical Corps.

When invited to address the British Medical Association on *Venereal Prophylaxis*, I realized how difficult it would be to treat the subject in a practical manner and spare you interminable detail. The first thing necessary is a definition of prophylaxis in so far as it concerns the prevention of these sexual diseases.

Venereal prophylaxis may be defined as a complex system whereby individuals are protected from the cause and effect of specific infection.

If so, the treatment of the patient from the beginning to the end of the malady is merely one measure of protection—a belated effort. It is our duty to do more for the people than merely cure their disability when it has been established. Begin at the beginning, and not at the end of things. Let us apply our technique to a disordered mind in the first instance; and if that fails we should intervene during the incubation period of the bodily disease very soon after its infection has been received.

In the practice of our profession it is customary to explore the previous history of the case in a manner worthy of the issues involved. No less care is necessary in regard to symptoms and physical signs, prognosis and treatment; a logical sequence of events no part of which may be disregarded without detriment to the patient and damage to our own prestige. I suggest that all these social evils should be approached in much the same way; for unless we learn to practise the prophylaxis, as we do the treatment of venereal disease for instance, it is impossible to relieve whole communities when they are physically, morally and mentally sick.

Suppose we take the case of Singapore as our illustration. It is an afflicted city and a convenient subject on which to base more practical conceptions of prophylaxis. So far as I know the previous venereal history of Singapore is more or less obscure. We are told that all was not well with the city; Contagious Diseases Acts were instigated by one party and destroyed by others, &c. Beyond this very little has been recorded for consideration and guidance.

The Venereal Diseases Commission Report, issued by the Government of the Straits Settlements in the year 1923, is a very remarkable paper—everyone should read it—yet its authors would be the first to admit that it is merely a last chapter of events in Singapore. It refers to a condition of affairs which is terrible and far-reaching in its effects and influences; a potential source of peril that may even embarrass the defences of this Empire in the Far East.

---

[1] A paper read before the British Medical Association (Malayan Branch).

The Previous History.

I will endeavour to picture the previous specific history of Singapore by considering one part—a small section of the entire population. We can show you the previous statistics of venereal disease for this garrison.

Our numbers were small in those days. Prophylaxis was unknown. Intemperance of every description prevailed. Sexual intercourse was promiscuous. There was little to choose between the morality and mentality of the soldier and civilian. Both were floundering in stark ignorance with regard to personal hygiene, and the inner meaning of sex conveyed little or nothing to them. Both were exposed to a rising tide of infection in the slums and on the roads of Singapore.

The incidence of disease in barracks partly reflected the venereal incidence in the city; but the military ratio per 1,000 can never be accepted as an accurate control in this respect because the soldier, at least, was treated for his disease while the civilian was often left without treatment. There was no organized treatment for diseased persons in the civil population.

The histogram of the incidence of venereal diseases in the Malaya Command here given has been compiled from the Army Medical Department Reports on the Health of the Army and recent statistics during the period 1878-1924. To facilitate consideration it has been divided into intervals, which disclose remarkable changes in the incidence during forty-six years, and collectively tell a story of suffering and misfortune difficult to surpass in the annals of His Majesty's Forces.

The earliest record available is the average admission ratio of 167·8 per 1,000 for the period 1869-1877, but the returns for individual years in this interim are not available. A Contagious Diseases Act was then in force.

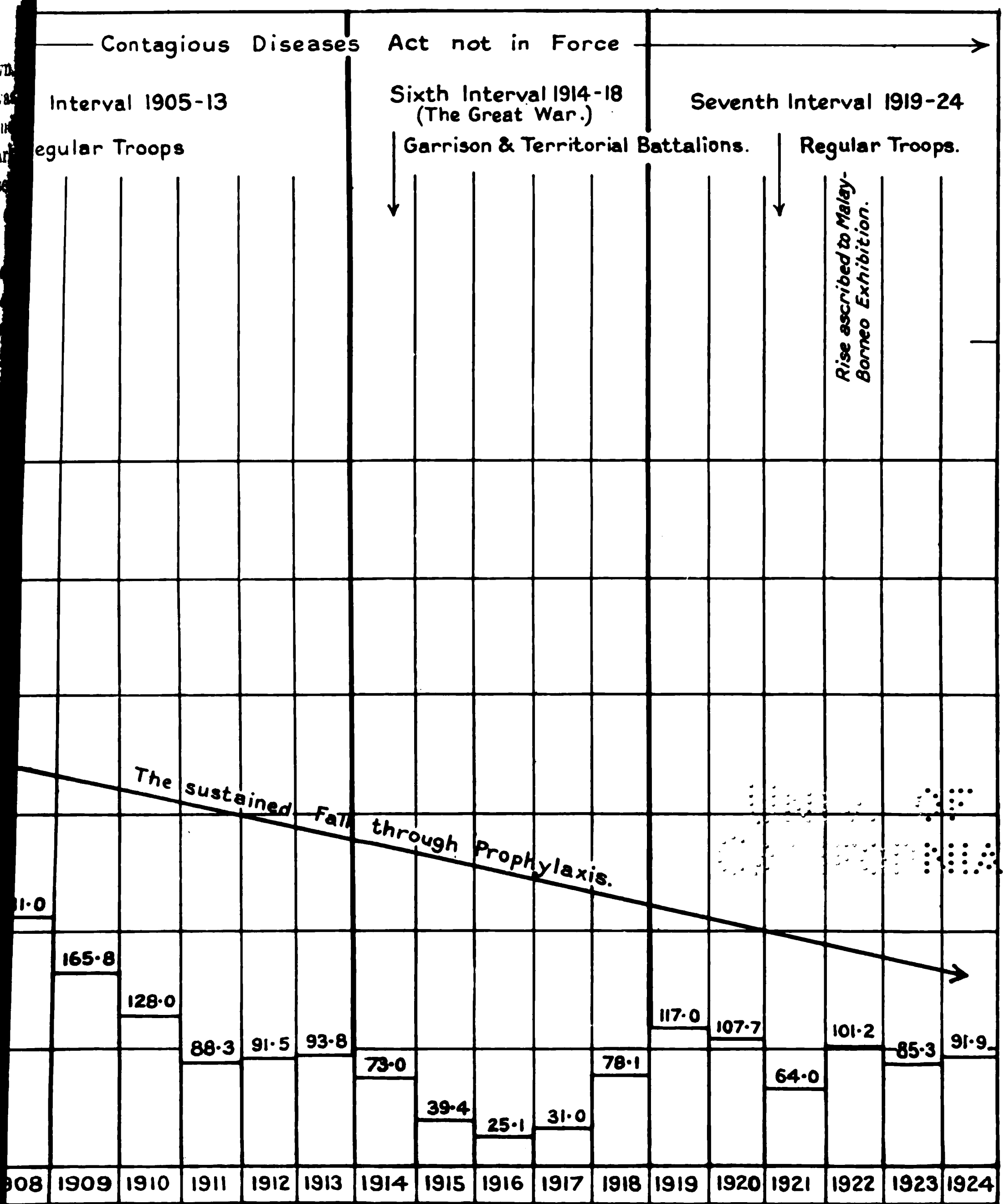
First Interval on the Histogram, 1878-1887.

The Contagious Diseases Act continued in force throughout this period and the ratio per 1,000 varied between 131·3 to 260·7, with an average for the ten years worth 181·43 per mille. The 260·7 per 1,000 shown for the year 1884 is starred with the remark: "Increase due to stricter nomenclature." In other words: these statistics concealed disease in a garrison which was supposed to be protected by a Contagious Diseases Act.

Second Interval on the Histogram, 1888—1898.

As the result of an agitation in London the Contagious Diseases Act was abrogated in 1888; with the result that the incidence of venereal disease increased from 197·3 to 423·7 per 1,000 in that year, and to no less than 646·1 *per mille in the year* 1889. The Senior Medical Officer, Straits

COMMAND
ORE
924



THE PREVIOUS HISTORY.

I will endeavour to picture the previous specific history of Singapore by considering one part—a small section of the entire population. We can show you the previous statistics of venereal disease for this garrison.

Our numbers were small in those days. Prophylaxis was unknown. Intemperance of every description prevailed. Sexual intercourse was promiscuous. There was little to choose between the morality and mentality of the soldier and civilian. Both were floundering in stark ignorance with regard to personal hygiene, and the inner meaning of sex conveyed little or nothing to them. Both were exposed to a rising tide of infection in the slums and on the roads of Singapore.

The incidence of disease in barracks partly reflected the venereal incidence in the city; but the military ratio per 1,000 can never be accepted as an accurate control in this respect because the soldier, at least, was treated for his disease while the civilian was often left without treatment. There was no organized treatment for diseased persons in the civil population.

The histogram of the incidence of venereal diseases in the Malaya Command here given has been compiled from the Army Medical Department Reports on the Health of the Army and recent statistics during the period 1878-1924. To facilitate consideration it has been divided into intervals, which disclose remarkable changes in the incidence during forty-six years, and collectively tell a story of suffering and misfortune difficult to surpass in the annals of His Majesty's Forces.

The earliest record available is the average admission ratio of 167·8 per 1,000 for the period 1869-1877, but the returns for individual years in this interim are not available. A Contagious Diseases Act was then in force.

FIRST INTERVAL ON THE HISTOGRAM, 1878-1887.

The Contagious Diseases Act continued in force throughout this period and the ratio per 1,000 varied between 131·3 to 260·7, with an average for the ten years worth 181·43 per mille. The 260·7 per 1,000 shown for the year 1884 is starred with the remark: "Increase due to stricter nomenclature." In other words: these statistics concealed disease in a garrison which was supposed to be protected by a Contagious Diseases Act.

SECOND INTERVAL ON THE HISTOGRAM, 1888—1898.

As the result of an agitation in London the Contagious Diseases Act was abrogated in 1888; with the result that the incidence of venereal disease increased from 197·3 to 423·7 per 1,000 in that year, and to no less than 646·1 *per mille in the year* 1889. The Senior Medical Officer, Straits

Settlements, states that "the evil is increasing at each station, and so far as I can see there is no limit to its future ravages." He further remarked that "constitutional syphilis is increasing in virulence as well as in prevalence."

The record goes on to show how this ghastly state of affairs continued without relief during 1889, 1890 and 1891. In the years 1892, 1893 and 1894 it fell to 369·7, 356·4, and 365·9 per 1,000 respectively, but the reasons for this fall are not recorded.

In 1895 a battalion of British troops arrived from India with an admission rate for venereal disease that exceeded half their total strength. The garrison incidence rose to 623·5 per 1,000. The Senior Medical Officer states that "not only the individual suffers but the population must suffer also by so many diseased persons sown broadcast, as these men are, throughout the country." The incidence fell to 519·2 in 1896, 368·3 in 1897 and 348·0 per 1,000 in 1898.

Third Interval on the Histogram, 1899—1901.

A local Contagious Diseases Ordinance was enforced in 1899, and it caused a remarkable fall in the incidence—to 178·6 per 1,000 in that year, 155·6 in 1900, and as low as 96·2 per mille in the year 1901.

Fourth Interval on the Histogram, 1902-1904.

Notwithstanding the appalling results already recorded, the repressive Act which had reduced the incidence to 96·2 per 1,000 in 1901 was repealed, and the incidence of venereal disease rose forthwith to 239·3 in 1902, 322·3 in 1903, and 308·0 per 1,000 in the year 1904. There is nothing on record to show that those who destroyed our defences against venereal diseases in Singapore did anything to replace them.

Fifth Interval on the Histogram, 1905-1913.

This interval has not been arbitrarily chosen. It marks a definite change of policy by all concerned with the prevention of venereal diseases in the Army, a change which saved the troops from an even greater misfortune than that of 1888-98.

In a military despatch as far back as 1897 Commanding Officers were directed:—

"*To appeal to the higher instincts of soldiers to avoid vice, and to warn them against its results. To encourage games and wholesome recreation, and to remember that the soldier will listen to the advice of those whom he can respect for their blameless life, higher education, and technical knowledge.*"

This brilliant conception was ahead of its time in Malaya. There is

nothing to show that anything beyond "repressive legislation" was contemplated here, notwithstanding the teachings of Lister and the demands of common sense. Nevertheless, 1905 marked the beginning of a steady reduction of the venereal diseases in this garrison, while it is safe to assume that their ratio per 1,000 in the city continued to expand and is still expanding progressively.

Sixth Interval on the Histogram, 1914-1918.

The incidence of venereal disease in the garrison at Singapore fell under the influence of prophylaxis from 276·4 per 1,000 in 1905, to no less than 25·1 per 1,000 in the year 1916. It was 73·0 in 1914, 39·4 in 1915, 25·1 in 1916, 31·0 in 1917 and 78·1 per 1,000 in the year 1918. This gives the remarkably low average of 49·3 per mille during the five years under review.

Seventh Interval, 1919-1924.

During the years 1919-24 inclusive, the average was 94·5 per 1,000, an increase of 45·2 per 1,000 by comparison with the previous interval on the histogram.

The Average Ratio per 1,000 for Fifty-five Years, 1869-1924.

The incidence of each interval projected to Item H on the Statistical Chart of comparative analysis gives an average ratio per 1,000 worth 216·61 for the whole period under review.

Note for the Period, 1905-1924.

(*a*) How consistent and steady the fall was.

(*b*) How an ideal type of prophylaxis controlled the situation in Singapore during 1915, 1916, and 1917. The garrison and territorial battalions here during the Great War included many responsible and well educated men from good homes and families in the United Kingdom. To men such as these a brothel is a damnable place.

(*c*) How, after the war, we lost some of the ground previously gained. The adverse influence of active service, the return of young troops, and the steady increase of venereal in the surrounding populace are three factors in this relapse.

(*d*) How prophylaxis in the Army was not dependent on force; and I will also endeavour to suggest to you why we stand to gain more from this benevolent form of protection in the future than ever we did in the past.

Symptoms and Physical Signs.

For these I must refer you to the Venereal Diseases Commission Report of 1923. The evidence there stated is true of the situation in Singapore—which is alarming. I am not prepared to criticize the Committee's recommendations because the subject is far too contentious for useful discussion. To question the Committee's good faith seems unjustifiable. One might just as well query the good faith of those who are now endeavouring to establish the naval and military defences of Malaya; and remember there can be no such thing as efficiency in any scheme of defence which rejects this prophylaxis.

Venereal is now so prevalent, that a man who patronizes brothels and prostitutes in Singapore cannot escape infection—and nothing short of disinfection on each occasion will save him from active disease in due course.

Possibility of Preventing Venereal Disease in Singapore.

To what extent is it possible to relieve this city and effect an insurance to safeguard our interests in and beyond Singapore? Before any opinion is given let us recapitulate in a general way some of the factors inseparable from the question.

"East is East and West is West"; the outlook, habits, customs, social restrictions of the people here and at home are widely different. The same applies to education, which is pathetically primitive in the one case and well advanced in the other.

The status and influence of the woman in Asia is insignificant. Her influence in western nations is very great and her suffrage is extending in every direction. This factor concerns the marriage tie, which unites co-partners in the West and the man and his subordinate in the East.

The primitive requirements of life, such as food, clothing and accommodation, etc., are one thing in Asia and another in Europe and America. A mere glance at these items will show that although the moral code east and west of Suez is similar in certain respects it is dissimilar in many ways.

Girls develop quickly in the East. They reach sexual maturity very early in life (at the age of 13 or 14) and they retain their simplicity for years afterwards. They do so in communities where the moral code is lax and respect for the weaker sex is often in abeyance. The origin and customs of the various races included in a mixed community, sex attractions and distractions—many of them highly artificial—diet and exercise, stamina and intelligence must be thought of in regard to prevention. Common knowledge of venereal diseases is important; we have whole communities in Malaya, for instance, who are freely infected, yet vaguely aware of the reasons why they are so afflicted. What are the schools doing in this matter? Problems of housing and unnatural concentration

are also involved in prophylaxis. And however much we desire to influence others in regard to sex, let us never overlook one very elementary fact. Sex instinct is vital, and in the vast majority of cases it cannot be denied indefinitely.

The Venereal Diseases Commission of 1923 summarized the position as follows:—

"It will thus be seen that in any attempt to judge the conditions of the great majority of the inhabitants of Singapore, no parallel can be drawn with western conditions, and further, that any judgment save that formed by observers who have resided in Singapore for a considerable time cannot but be absolutely and entirely fallacious."

Our prognosis must be guarded. Everything depends on the standard of efficiency His Majesty's Government here and at home is able to effect for the success of a belated effort in Singapore. Given efficiency, the prospects are reasonably good, but some years of heavy and devoted labour will be needed along the foundation of things before any material progress or result can be recorded.

The Treatment of the Patient.

I am sorry to bore you with more unpleasant statistics; but it seems necessary to compare previous methods of treatment and their results in order to suggest what must be done in the interests of a brighter and a better Singapore. I will endeavour to do so as briefly as possible.

Observations on the Statistical Chart. 1869-1924.

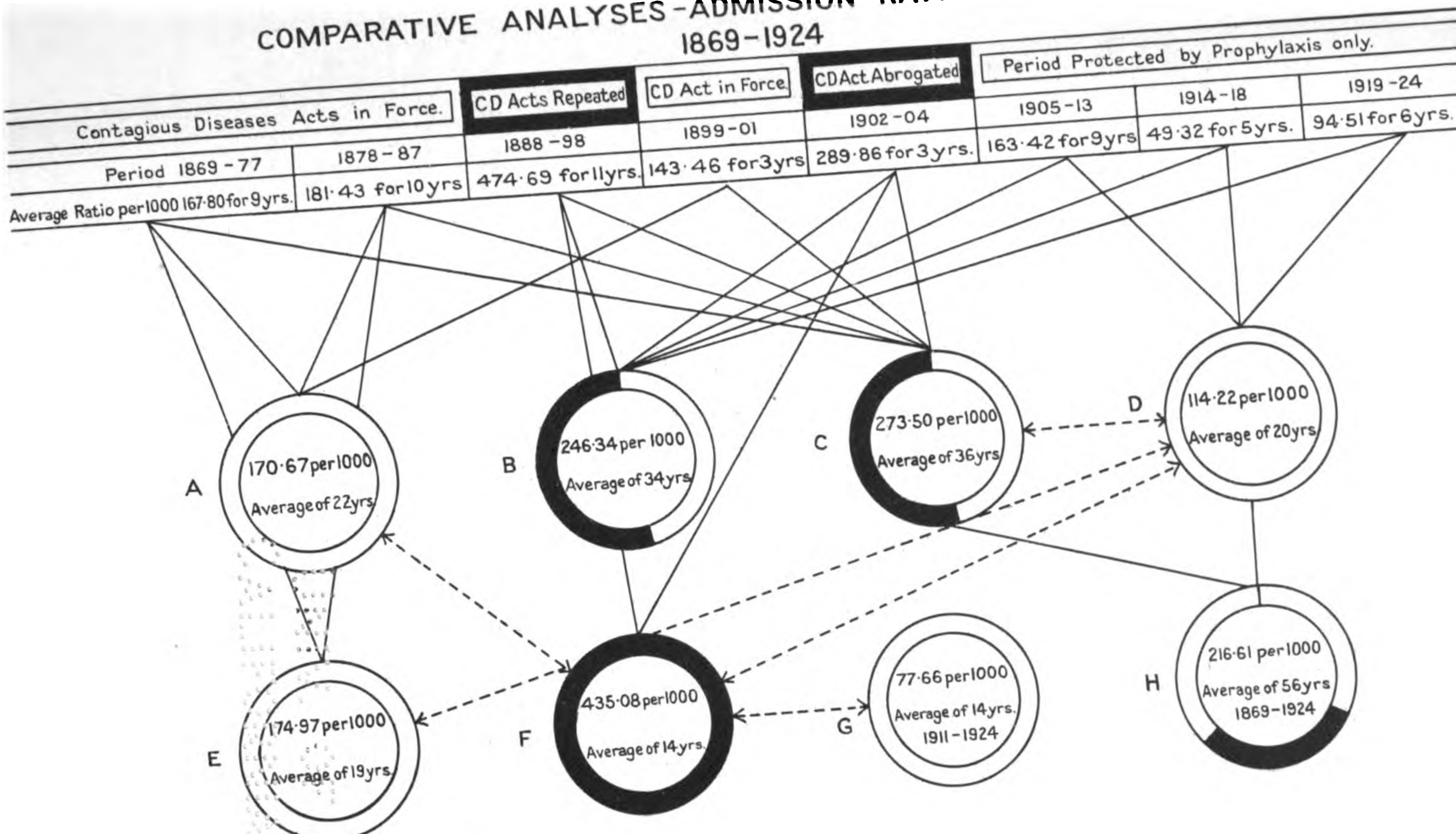
A Comparative Analysis of Unprotected Periods and Certain Intervals when the Garrison was more or less Covered by Repressive Legislation or a Benevolent Prophylaxis.

The chart is divided into similar intervals to those shown on our histogram, and includes one additional interval, namely, 1869-77. Each interval shows the average ratio per 1,000 strength for its time. The interval averages are projected by straight lines to circles on the body of the plan, where they are variously grouped to facilitate comparison. Cross references are indicated by dotted lines. Averages so arranged indicate the value of each and every system—including that of masterly inaction—attempted for the combating of venereal diseases in Singapore from 1869 to 1924 inclusive.

Prophylaxis—Twenty Years *versus* No Protection—Fourteen Years.

Item D (114·22) compared to Item F (435·08) shows that prophylaxis was better for the Army than no protection by an incidence worth 320·86 per 1,000. Moreover, fourteen unprotected years shown at Item F (435·08) cost the troops a 357·42 per 1,000 incidence of preventable disease that

COMPARATIVE ANALYSES - ADMISSION RATIO PER 1000 STRENGTH 1869-1924



was subsequently avoided by prophylaxis during the last fourteen years—Item G (77·66).

Prophylaxis—Twenty Years *versus* all other Plans—Thirty-six Years.

The difference between Item C (273·50) and Item D (114·22) proves that, when available between 1869 and 1924, prophylaxis reduced the incidence of venereal disease for the garrison of Singapore by an admission ratio worth 159·28 per 1,000; and if the statistics for the years 1878-87 had been faithfully recorded the advantage would be still more apparent.

Prophylaxis—Twenty Years *versus* Contagious Diseases Acts—Twenty-two Years.

The combined average incidence for prophylaxis at D (114·22) compared to that of protective or repressive legislation on Item A (170·67) shows a balance in favour of prophylaxis worth 56·45 per 1,000. However, prophylaxis was not attempted until the last third of the period 1869-1924, during which we were in the presence of a steadily rising incidence throughout the general population of Singapore.

Similar comparison between Item E (174·97) and the Item D (114·22)—the first nineteen years compared to the last twenty years of the total under review—proves that prophylaxis afforded 60·75 per 1,000 better protection than the Contagious Diseases Act in force up to the year 1887. Again, the incidence of venereal disease in this Command during the past eleven years (1914-24) shows an average ratio per 1,000 of 73·97. If that figure be compared to the total effect of Contagious Diseases Acts for the twenty-two years grouped at A (170·67), prophylaxis gave us more than 96·70 per 1,000 better protection.

Contagious Diseases Acts—Twenty-two Years *versus* No Protection—Fourteen Years.

The difference between Item A (170·67 per 1,000) and Item F. (435·08) shows that protective legislation reduced the admission ratio per 1,000 by 264·41 during the period of thirty-six years tabulated on the chart. In other words, the repeal of the Contagious Diseases Acts, prior to the unprotected intervals 1888-98 and 1902-04 was immediately followed by an average admission ratio per 1,000 that was 264·41 in excess of the periods 1869-77, 1878-87 and 1891-1909 in combination.

Contagious Diseases Acts—Twenty-two Years *versus* all other Plans—Thirty-four years. (Item B. 246·34.)

The incidence during the Contagious Diseases Acts grouped at A (170·67) shows that closely controlled brothels saved the troops an incidence of venereal disease worth 75·67 per 1,000.

Contagious Diseases Acts and Prophylaxis—Forty-Two Years—*versus* Inaction—Fourteen Years.

The combined protection afforded by Contagious Diseases Acts and prophylaxis during forty-two years gave an incidence of 143·79 per 1,000. This incidence compared to 435·48 per 1,000 for the non-protected periods grouped at F shows that active measures saved the troops to the extent of 291·29 per 1,000.

However well our records prove, or disprove, the value of Contagious Diseases Acts for the prevention of venereal disease, military authority is not in a position to instigate such measures. Right or wrong, these laws enhance prophylaxis for us to the extent indicated. Nevertheless they do not lessen our duty in regard to counter-attractions and other preventive measures necessary for the protection of the troops.

Practical Measures of Prevention.

I will now endeavour to outline the methods adopted in the Malaya Command for the protection of its troops against venereal disease, and ask you to suggest how far these principles are applicable to Asiatic communities in this large and rapidly expanding city of Singapore.

Housing and Accommodation.

Unceasing efforts are made to try and improve the soldiers' home in barracks. Rigid economy must be observed, but a great deal has been done—and a great deal remains to be done—to improve accommodation.

Food and Messing.

The troops are provided with good food, which is well cooked and served in a civilized manner. The present system of messing is far in advance of what the soldier had to endure during the early days of this story. The food was then poor and the cooking was worse. Men fed in their barrack-rooms, and their beds were often their only tables—it was a case of the bed or the floor.

Efficient dining-halls are now a feature in every barracks and for all units. The man sits down to a clean tablecloth, varied courses are served at each meal by troops told off for the duty, equipment is serviceable, and the food itself is as good or better than some of us have on our own tables. As a rule the weekly menu for the troops is an object lesson in what can be done by considerate officers.

Regimental Institutes.

It is a pleasure to walk through the Regimental Institutes in Tanglin Barracks. Nothing is overlooked. The man has reading and writing rooms, modern books, magazines, periodicals and papers. There is ample accommodation for everyone—well ventilated, bright and appreciated by all ranks. Canteens, coffee-shops, billiard-rooms and so forth go to make up

a degree of comfort never dreamt of in the old days. Its atmosphere is good and the troops therefore prefer Tanglin to the streets of Singapore. They spend most of their time and practically all their spare cash in barracks.

Baths and Swimming Baths, etc.

Shower and hot-water baths are available and efficient. Clear water over white tiles, comfortable arrangements for dressing, good light and scrupulous cleanliness are features of the swimming baths. They are very popular with the men.

Sport.

Organized sport of every description is now so general in the Army that everyone takes it as matter of course. Commanding and company officers see that nothing is left undone to ensure efficiency, and promote the interests of sport in their own units, and by friendly contest with other units. We had nothing like this fifty years ago and the results were disastrous. Concerts, dances, whist drives, cinematograph films and so forth are counter-attractions which amuse and protect the troops during evening hours. Everything is organized; nothing is left to chance.

The Service of the Church.

I cannot say enough for a service which is being quietly carried on amongst the troops in this Command. It is not widely recognized, but those who are labouring in this section of the field will receive their reward in due course.

Schools and Classes of Instruction.

The soldier is educated in the Army and his prospects of success and pay largely depend on his industry in this direction. Needless to say the path is made easy for him; there is a separate organisation devoted to the work which is directed by specialists.

Technical Groups or Classes.

Tradesmen's classes are held in conformity with an organisation applicable to the British Army everywhere. The men are thus qualified for various trades in civil life. No one can say that the Service uses its troops as cannon-fodder and discharges them into the street, strangers in a world which has no use for them. The transformation of a recruit in the Army is an astonishing affair; and only those who have served, as I have, on the London recruiting staff can appreciate what these results stand for in the British Empire. After all, the prophylaxis we have in the Service to-day is only an extension of what the A.M.D. Report for India summarized as follows in the year 1905: "Men are taught to practise self-restraint and taught the dangers of an unhealthy life; athletics and games are encouraged

and every inducement offered in the shape of Service pay to the efficient and home comforts to all—to induce men to take their profession to heart, to spend their evenings in barracks and institutes.

"Coffee and recreation rooms are universally provided, and the closest possible sympathy in all forms of barrack comforts and amusements is exercised by Commanding Officers, Company and Medical Officers."

Counter-attractions are the very essence of venereal prophylaxis, and the work of regimental officers should not be forgotten. They are directly responsible for the welfare of the men and their influence is invaluable.

Headquarters Directorate.

The campaign against venereal diseases in Malaya Command is directed by Medical Headquarters in addition to other duties. Briefly, the work is as follows:—

(1) *A Weekly Inspection to Observe the Health of the Troops.*

All single other ranks attend these parades, and the medical officers responsible ensure that absentees are properly accounted for and subsequently inspected. Our records show that only one soldier concealed his disease since the campaign began in 1923. His comrades reported the case confidentially, and he was recommended for trial by court-martial. These facts do not suggest that prophylaxis in Malaya depends on force.

(2) *Lectures and Practical Instruction.*

(*a*) Lectures are regularly delivered by officers of the Royal Army Medical Corps.

(*b*) Brief advice on prophylaxis is given from time to time at the weekly health parades.

(*c*) Troops who attend the City Preventive Ablution Centre are taught to use a preventive outfit, and certified when proficient by the attendant in charge.

(*d*) Every venereal patient must prove that he has a good working knowledge of sex hygiene before he is permitted to leave hospital.

(*e*) A suitable pamphlet on Venereal Prophylaxis and local dangers is included in every British soldier's kit in the Malaya Command. Four thousand copies are held by Military Headquarters for issue to new arrivals.

(*f*) The Deputy Assistant Director of Pathology delivers special lectures whenever the troops become careless to any important degree.

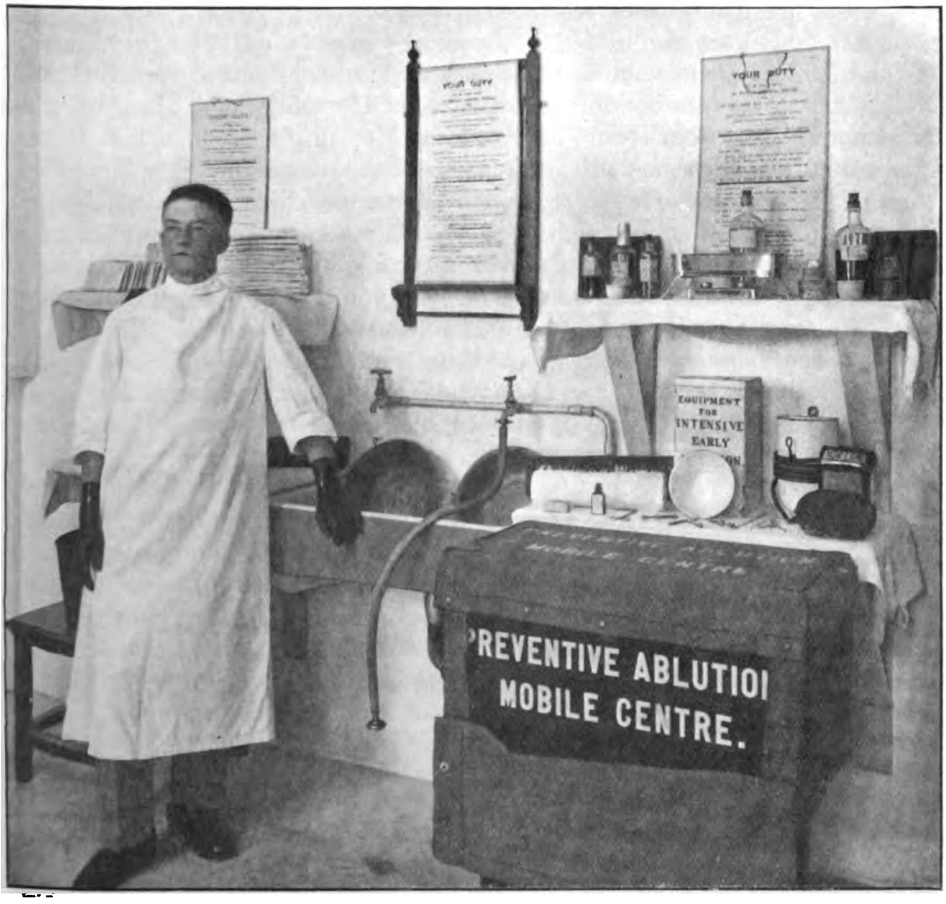
Cinematograph Films.

Four films from the National Council for Combating Venereal Diseases have been released in Singapore to date during this campaign, and two more have just been received from home. One hundred seats were reserved for civilians and the remaining accommodation was overcrowded

by troops who attended voluntarily. The influence of these films was definitely beneficial. The films were subsequently passed to Hong Kong for the Naval and Military Services in the China Command.

PREVENTIVE ABLUTION CENTRES.

(1) Each unit or unit group has full facilities for personal disinfection —accommodation being set apart and fully equipped to scale for this purpose.



PREVENTIVE ABLUTION SERVICE, NEW UNION JACK CLUB, SINGAPORE.

(2) A City Centre in charge of a skilled attendant from the Royal Army Medical Corps is open from 7 to 12 midnight every night in the year. This service has been established at 90, Bencoolen Street, close to the main brothel area, and it is available for all H.M. Forces in or visiting

Singapore. Attendances are rigidly controlled by voucher, of which more anon.

(3) A Mobile Preventive Ablution Centre has been constituted. Its pannier equipment is in charge of a skilled Royal Army Medical Corps attendant, and it serves all troops when in camp and on the line of march, etc. Its facilities are precisely the same as those in our City Centre.

Record Vouchers.

Both attendance at the centres and the completion of record tickets by the troops is entirely voluntary.

Attendances are recordable at three centres only: (*a*) The City Centre; (*b*) the Mobile Centre on the line of march, etc.; (*c*) the Special Centre, New Union Jack Club, which we open for His Majesty's Fleet when at Singapore. The man enters his regimental or ship's number, but not his name, on a printed ticket in the presence of the attendant. The attendant then notes the unit on the reverse, with the approximate interval between infection and disinfection, and signs the document. An officer checks the serial numbers and files the tickets on a confidential card index daily.

Troops who contract venereal disease and show no record for disinfection forfeit their proficiency pay after leaving hospital. They do so at their commanding officer's discretion, which is based on the advice we record in the interrogation report rendered by every venereal patient on his admission to hospital. The loss of proficiency pay varies in this Command from six to twelve months, and of course all venereal casualties are liable to hospital stoppages at 1s. 6d. per diem. Over twelve hundred disinfections have been recorded at these centres during 1924-25 to date. The record includes twelve failures—eight or nine of them cases where men were given the benefit of their doubtful claims to have taken all reasonable precautions.

Patient's Interrogation Report.

A *pro forma* interrogation report is rendered from the hospital wards for every case of venereal disease directly after his admission. The report is required in duplicate—for necessary action, submission to the man's O.C. and our record. Its value as a practical means to an end has been fully proved during the present campaign in Singapore. An interrogation report not only marks out the source of infection, and states in detail the precautions which the patient took, or failed to take, for the protection of his health after receiving infection, it gives a constant line of thought and action direct from the victims of this disease. In practice it has been found that this report is one whereby the soldier is impressed with the requirements of self-preservation, and round which our entire system of prophylaxis may be said to revolve.

Uses :—

(1) To fix responsibility for omissions or neglect on the part of the man or those responsible for his safety.

(2) To correct seeming defects in the practice of preventive ablution at the City Centre or elsewhere.

(3) To investigate failures in prophylaxis due to lack of understanding in this or that unit.

(4) To advise Commanding Officers in detail for every case of venereal disease and submit necessary recommendations thereon.

(5) To prepare a special warning for the troops on the admission of each venereal patient. This warning is issued to all units on a printed form and is posted on their order boards. Names are excluded. Copies are submitted to the Naval authorities for communication to H.M. ships when in port. The Chinese Protectorate and police authorities are likewise informed.

Every venereal patient is conveyed to the Chinese Protectorate and from thence to the source of his infection in the brothel area, or to the road point at which he was solicited. A photograph album of the female contagions is now maintained to facilitate their identification as required, and our venereal survey plan fixes the source of every fresh infection in Singapore city. Action taken by the General Officer Commanding the troops in Malaya has led to an important amendment of Ordinance No. 96 (Minor Offences) Straits Settlements. Persistent soliciting or importuning by prostitutes is now a punishable offence within the law.

The Problem of Alcoholism and Improvidence.

There is ample evidence to prove that a considerable proportion, if not the greater part of our present incidence of venereal disease in the garrison of Singapore is indirectly due to the effects of alcohol. We refer to a minority, not to the majority of our troops, who are a temperate and well-behaved body of men. Once a man is intoxicated, or even half drunk, his discretion goes by the board. If discovered in time the infected men can be saved by prophylaxis. It is now our duty to make them available for twelve hours mild abortive treatment, which we call Intensive Early Ablution.

Procedure.

(1) Every soldier confined to the guard detention room after absence from barracks is interrogated as to whether he risked infection or not.

(2) If incapable his interrogation is delayed until he is fit to reply.

(3) Instant action is taken day or night to afford intensive ablution when the soldier admits having risked infection.

(4) Intoxicated or semi-intoxicated men sent to hospital for the above treatment are accompanied by a guard of one N.C.O. or private, who remains with the case until no longer required to assist the hospital authorities.

(5) Troops are informed of these arrangements and warned of their responsibility with regard to this and all other preventive measures necessary for the protection of their health.

Working overnight, our teams are able to return such people to their units free of infection at about 12 noon the following day, and several cases of gonorrhœa have been aborted in this way during the initial stage. No personal record is taken other than the man's unit and regimental number. The procedure is therefore on the same footing as preventive ablution; and men who delay disinfection are now given a last chance to escape venereal. They may report at the hospital for this item of prophylaxis any time, and are not even asked to render a sick report. Many have done so in the past. If the man is satisfied something is wrong we are content; his treatment may or may not be necessary, but the return we receive in propaganda is well worth the labour involved.

Technique.

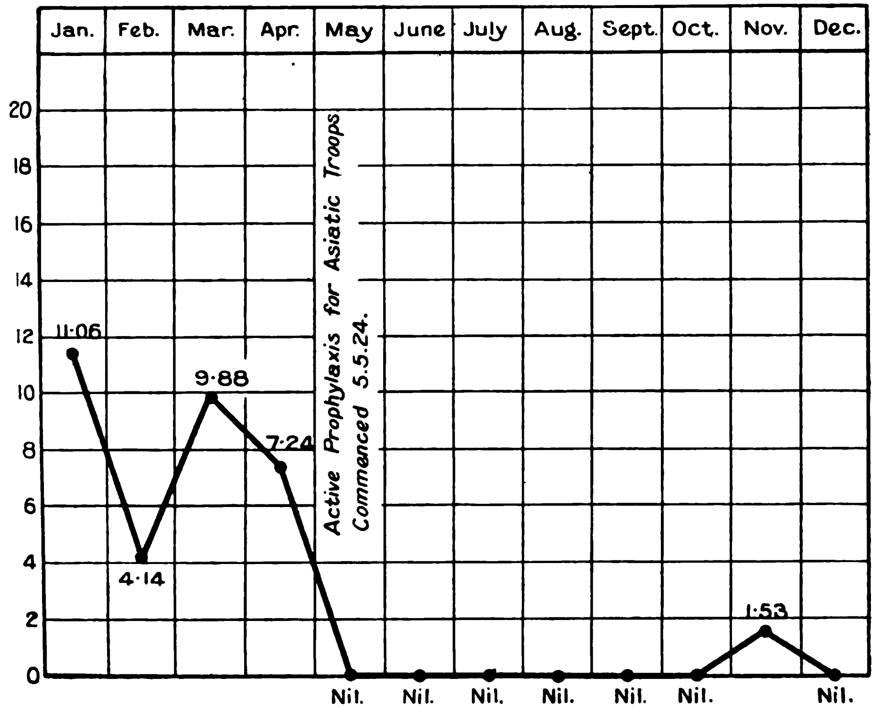
As members of a learned profession I steadfastly maintain it is our duty to support the science of morals, which is the master key to all social evils, whether they are associated with sexual considerations or not. Even so, we must see to it that the issue is not confused. Venereal cases are just as much entitled to our professional respect and skill as those who present themselves with the more fashionable diseases. For the sake of the patient, for the sake of our own reputation, and for the honour of the whole profession our prospective must never fail at this point.

I received a letter from a valued friend and colleague last mail, in which he said: "Could you manage to insert a tactful reference to the necessity for acquiring a high standard of treatment, a greater seeking after the better technique—larger appreciation of the most trivial details of 'toilet' in technique. You and I, and others, must agree that a great deal still remains to be accomplished in this field, and that never was a gospel more worth the preaching." I agree with my friend that we should do all these things, and that we should proclaim the gospel of Venereal Prophylaxis in a dignified manner. Was it not Jowett who said: "The perfection of style is variety in unity, freedom, ease, clearness, the power of saying anything, and of striking any note in the scale of human feelings, without impropriety."

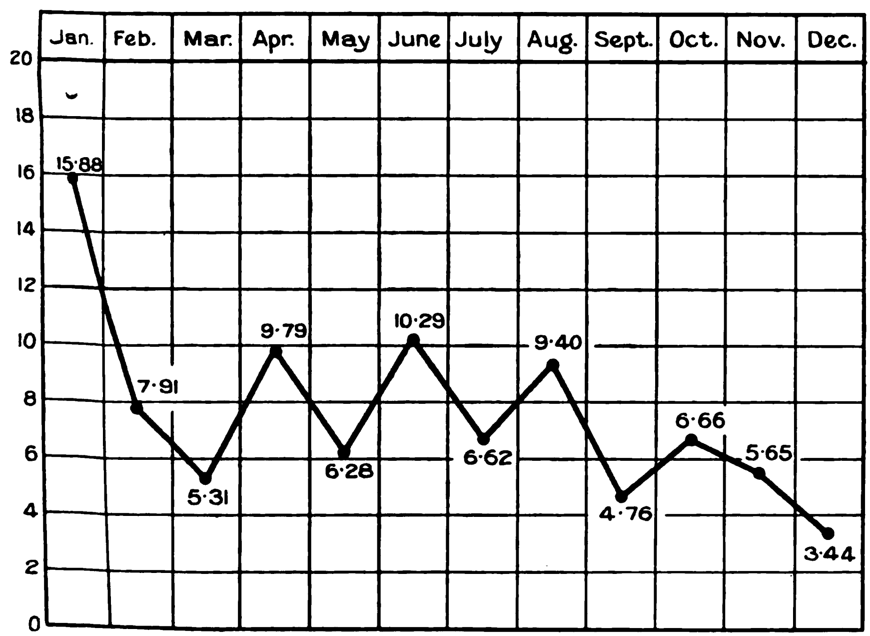
Primary Results in the Present Campaign, 1924.

The monthly admission ratio per 1,000 strength was 15·88 in January. It dropped to 7·91 per 1,000 in February and 5·31 in March. The 9·79 per 1,000 recorded for April includes four cases which contracted infection in camp and on the line of march before full prophylaxis was established for these troops. May gave 6·28 per 1,000. The rise to 10·29 in June was probably due to placing Malay Street out of bounds to the troops on May 27. The incidence fell to 6·62 in July. Other ranks then neglected their preventive ablution to some extent and the ratio increased to 9·40 in

Venereal Diseases—Malaya Command—Monthly Admission Ratio per 1,000 Asiatic Troops in Taiping, 1924.



Venereal Diseases—Malaya Command—Monthly Admission Ratio per 1,000 British Troops in Singapore, 1924.



August. A special lecture was given with reference to this defect and the incidence fell to 4·76 in September. October reads 6·66, November 5·65 and December 3·44—a steady fall which began at the end of August. The figure 3·44 per 1,000 for December was the lowest on record since March, 1923. It includes three December infections and one N.Y.D. (remaining) case classified venereal during that month.

Comparative cost accounts for the first and last six months of 1924 will probably show that prophylaxis saved between £600 and £700 in the treatment, hospital, and general expenses of venereal patients during the last half year; but the full financial effect of this campaign will not be really apparent until the end of 1925. Once the precedent for which we are labouring is established and recorded it will be the duty of our successors to maintain, extend, and improve the services of prevention in the Malay Command during future years.

1925.

The incidence during January, 1925, rose to a 6·01 per 1,000 strength, which is 9·87 less than it was in January, 1924. This temporary increase was the result of Christmas festivities in barracks.

During February, 1925, *no fresh infection was contracted by any soldier in the Malaya Command.*

The strenuous attempt we have made to protect these troops against venereal disease may seem unusual and, to some, not altogether necessary. It was our duty.

Conclusion.

So far the results are gratifying, but the incentive is greater. If supported, we desire to assist the State in a much larger concern, and thus help the Government of the Straits Settlements in its forthcoming attempt to defeat an enemy which is striking Singapore *intra muros.* In this respect there is not much chance of success—indeed there is every possibility of failure—unless the medical profession is willing to recognize the principles of venereal prophylaxis and is prepared to practise them in a spirit worthy of our greatest traditions. Meanwhile credit is due to those laymen and women who are struggling to fill the breach until we can descend to do what is clearly our duty to the State, namely, to form and lead public opinion in its final effort to reduce this social evil to negligible proportions.

Our profession directs the *Special Service* with honour to itself in the United States of America, and we should not do less for the dominions of Great Britain's empire.

I have to acknowledge Dr. Malcolm Rattray's untiring help and support in the writing of this paper.

Note.—The admission ratio was 91·9 per mille for 1924 and 56·8 per mille for the year 1925. Prophylaxis has thus afforded additional protection worth 35·1 per mille. during 1925.

CHLORAMINE TREATMENT OF WATER IN THE FIELD.

By Major C. H. H. HAROLD.
Royal Army Medical Corps.

In accordance with War Office instructions a trial was carried out during divisional training and army manœuvres. Arrangements were made for this by the Aldershot Command and the facility with which it was carried out was largely due to the Assistant Director of Hygiene, Lieutenant-Colonel J. T. Johnson, D.S.O., R.A.M.C.

The 1st Division was selected by the Command as affording the best scope for the trial and particularly the 2nd Brigade. To Major-General Sir A. A. Montgomery, K.C.B., K.C.M.G., and his staff I am indebted for ever ready assistance.

In the 2nd Brigade the trial was followed with interest by all. The Brigade Commander, Colonel Commandant J. G. Dill, C.M.G., D.S.O., visited the laboratory and inquired into the methods of manufacture of the compounds. His appreciation of the treated water which perforce he drank daily was gratifying. The men themselves were not unappreciative of an attempt to eliminate taste from doped water and when called upon to carry out the treatment entered fully into the spirit of the trial. In fact, from every point of view, in contradistinction to the usual atmosphere of suspicion which deservedly surrounds all poisoners of water, nobody could have been more happily placed.

The bacteriological and chemical check on the field trial gives accurate and valuable information regarding the value of chloramines under general service conditions and the presence of No. 1 Mobile Laboratory instead of an improvised one contributed largely to the good results obtained.

The work carried out may be apportioned as follows:—

Period 1.—Preparation.

Period 2.—Controls and examination of supplies.

Period 3.—A comparison of efficiency of the compounds by various methods.

Period 4.—Estimation of minimum safe dose.

Period 5.—The use of a standard dose of monochloramine against all types of water, and this includes the manœuvre period.

The laboratory arrived in Tichborne Camp on September 2 and on the 2nd, 3rd and 4th we were busily engaged in opening out and getting things in order.

It may be pointed out that although this trial was lightly undertaken and at ordinary times might prove to be a simple matter, with the limited time at our disposal and in face of the abnormal climatic conditions, it was a difficult and anxious task. One source of trouble was the time taken

in adjusting incubators recently drawn from store which were adversely affected by varying temperature under canvas.

Initially arrangements were made to take down a stock of sterilized and tubed media, so that the quality of the waters to be used could be examined and a certain number of chloramine controls could be carried out without delay. Concurrently with the performance of these the bulk of the media in sterile milk bottles was tubed and resterilized.

The troops arrived on the 4th and according to plan drew their water from the Itchen and treated it with bleach powder in the usual way. Immediately complaints *re* taste were received from certain units and on investigation proved to be due to faulty treatment. In several units this caused the men to evade drinking chlorinated water for three whole days. To avoid similar recurrences, from now onwards water treatment was supervised by the staff from the school and complaints regarding taste were infrequent although the taste of chlorine was perceptible.

A daily examination of the Itchen water by the Horrocks test was carried out and it proved to be a two-scoop water, usually absorbing from 0·6 to 0·8 p.p.m. of chlorine. On one occasion an increased absorption was noted and it became temporarily a three-scoop water. From the 4th to the 7th inclusive all water was treated with stabilized bleach. This period was selected because it covered a two-days' scheme and consequently men who had been drinking authorized water would at some time be compelled to have recourse to the chlorinated water in the carts. The majority of complaints *re* chlorine were received at this time and were due to the reaction of chlorine with tea extractives which produced the usual nauseating results. As our procedure was not being advertised it took a little time to convince the troops that this objectionable taste was not due to our activities and that the water was not being treated with chloramines. A demonstration to N.C.O.'s of certain units, at which an issue of tea brewed with water treated with chloramines was made, combined with the assurance that chloramine treatment was being commenced that day, produced a good effect. On the evening of the 7th chloramine treatment of all drinking water was carried out by my staff and in the course of the following morning messages of thanks were received via the water supervisory staff. From now onwards the success of the trial was assured.

Bacteriological examinations of the raw Itchen water revealed that it contained presumptive *Bacillus coli* in from 0·01 of a cubic centimetre and gave a colony count on agar of 2,200 colonies per cubic centimetre. Control tests with unclarified water, using our standard contact period, showed that these were eliminated with doses of dichloramine of 0·2 p.p.m. and 0·3 to 0·4 of monochloramine. A reduction in dosage below this was not considered advisable when using rough field methods of dosing; for some days fixed doses of 0·3 to 0·4 p.p.m. dichloramine or 0·4 to 0·5 p.p.m. monochloramine were used with satisfactory results.

At the same time, the Meon water at Soberton was found to contain presumptive *B. coli* in 0·1 of a cubic centimetre. Samples after treatment with 0·25 p.p.m. dichloramine showed that *B. coli* were absent from 100 cubic centimetres. Later it was found that using doses of dichloramine as low as 0·25 to 0·3 p.p.m. and 0·4 of monochloramine, *B. coli* were occasionally present in fifty cubic centimetres of treated unclarified Itchen water, after heavy rain and with our standard contact period, but were absent from 100 cubic centimetres after eighty minutes. Obviously in unclarified water the presence of particulate pollutive masses must be reckoned with. An increase in the doses of dichloramine to 0·75 and of monochloramine to 1 p.p.m. produced the desired effect.

From now onwards, these, the normal doses of chloramines employed during experimental trials at the Army School of Hygiene, were adhered to and proved satisfactory both bacteriologically and from the point of view of taste. From a survey of the wells in the Tichborne area it appeared that many of these might be seriously polluted and subsequent bacteriological and chemical tests confirmed this opinion. In every instance after contact with our standard doses of chloramine presumptive *B. coli* were absent from 100 cubic centimetres of treated water within the usual time limit.

The performance of bacteriological examinations during the period of active movement (Army Manœuvres) was not practicable, but a chemical control of the casual supplies was exercised. On one or two occasions even this could not be carried out, particularly during the heat of the battle centring around the Wallops. In all, water derived from three rivers (the Itchen, Meon and Test), and from more than fourteen casual supplies, wells, &c., was treated with chloramine during the trial. The majority of these waters were hard and were from lime-bearing areas.

The chloramines were made in accordance with the methods described in previous communications. The source of the chlorine water was a new type of sparklet generator with bulbs, and a tablet of ammonium carbonate supplied the N_2 radical.

The chloramines used were:—

(1) Monochloramine, made in the sterilizing kettle in a concentration of 25 p.p.m. by the interaction of standard chlorine with ammonium carbonate solution.

(2) Dichloramine, in a similar concentration but using only half a tablet of ammonium carbonate.

(3) Dichloramine, made in an ordinary enamelled mug by the action of two measuresful of chlorine upon $\frac{1}{4}$ or $\frac{1}{2}$ a tablet of ammonium carbonate. This allows for a fifty per cent loss of Cl_2 as HCl and the ratio of $Cl_2 : NH_3$ is from 8 : : 1 to 4 : : 1.

(4) Dichloramine, made by the action of one measureful of double strength chlorine water upon other inorganic salts of ammonium using the same ratios as in (3).

The method selected by the Director of Hygiene for general use was (1).

Briefly described—One tablet of ammonium carbonate is dissolved in 4 to 6 gallons of water in the sterilizing kettle carried on the cart. After stirring well, one measureful of standard chlorine water is poured into this solution and monochloramine results. The contents of the kettle are poured into the cart when three-quarters full of water.

In the past, from the point of view of taste, it appeared advantageous to use monochloramine, and it was suggested that this compound was more effective in the presence of iron and when contact periods were restricted, but dichloramine, as far as taste was concerned, using our standard dose, was also free from objection, and this combination appeared to be superior to monochloramine in the presence of excess nitrites and easily oxidizable organic matter, such as fresh urine.

During the trial no results were obtained which might lead us to modify these opinions. Monochloramine and dichloramine appeared equally effective, but the impression gained after carefully checking the results confirmed the view that dichloramine might not be so rapid in its germicidal action as monochloramine. It also appeared possible that dichloramine made by our standard concentration method of 25 p.p.m. might not be quite so stable under all conditions as dichloramine made by the interaction of chlorine with ammonium salts. In any case the differences suggested are slight.

During this period, when the efficiency of the different combinations was being examined and the doses varied, all chloramine treatment was carried out by my staff. Later, at the request of the Director of Hygiene, Colonel H. P. W. Barrow, the water duty men of the 2nd Brigade were instructed in this method of water treatment, and were issued with the necessary equipment. After a couple of demonstrations the majority found it quite a simple matter, and were permitted to perform this duty. It was reported that they found it simpler to carry out than the standard bleach treatment controlled by the Horrocks test. My supervisory staff kept a close eye upon all water duty men during this period and if difficulties had arisen they would have been noted.

It is reported that during the battle at Middle Wallop the water duty men of a certain unit belonging to the 3rd Brigade hearing of a new method of tasteless water treatment called upon my staff to treat their carts, and commented on the fact that at Soberton, where we designedly left a residual dose of chlorine of 0·3 p.p.m. in the water delivered by the water sterilizing lorry, complaints in regard to the taste of tea were frequent. My staff at this time were also asked to treat certain carts belonging to the 1st Brigade as the water duty men wished to avoid the use of bleach.

Throughout the trial no complaints *re* taste were received either as regards drinking water, or in the case of tea. As a matter of fact on occasions officers believed they were drinking untreated water, and did not credit the presence of any chemical until the addition of an indicator demonstrated its presence.

The apparatus issued to the water duty men was returned to the school at Aldershot on the termination of manœuvres and no breakages or difficulties were noted or reported.

It is a matter for satisfaction that within such a short time we were able to test the efficiency of chloramines in such a variety of waters, i.e., rivers, wells and even stagnant pools. This would not have been possible but for the keenness and loyalty of my staff, particularly Serjeants G. W. Mace and H. W. Watson, R.A.M.C., who acted as general overseers, and for days laboured in the laboratory, and Lance-Corporal Warminger, R.A.M.C., who cycled with the Brigade and kept in touch with the laboratory throughout. He was of the greatest assistance to the troops, being at hand night and day carrying out the Horrocks tests on the selected casual supplies, and assisting in their treatment. The advantage of having these highly trained men available was quickly grasped by the units, and on numerous occasions their aid was invoked by officers and men alike.

SIMPLE LARGE-SCALE INCINERATION IN THE TROPICS.

By Major A. L. OTWAY, M.B., D.P.H.
Royal Army Medical Corps.
Late Medical Officer of Health, Seccondee, Gold Coast.

The efficient, economical and rapid disposal of municipal garbage in the tropics is always an interesting and difficult problem, and the health of the community will depend to a large extent on its correct solution.

In all tropical countries we are exposed to the ravages of diseases spread by flies and other insects.

The aim of any tropical sanatarian is, amongst others, to keep down (*a*) the fly population; (*b*) the rat population.

If we can keep the numbers of both these pests under control and within reasonable limits it is evident that we shall have progressed a very long way on the road to victory.

Municipal garbage, containing as it does a very large proportion of organic matter in the form of waste food, provides an ideal breeding ground for both flies and rats, when collected for ultimate disposal.

Flies breed in such refuse in countless numbers in warm countries; in addition, it provides a "home from home" for the rat, together with free and easily gained food for his ever-increasing family.

The rat has merely to make his burrow and his home in the accumulated mass of garbage. When he needs food all that he has to do is to make a run in any direction.

No method of refuse disposal, short of dumping it into deep water, salt or fresh, or incineration, will prevent rats breeding therein.

The question of rat breeding has to be most seriously studied, as if this point were overlooked, an outbreak of plague might result. Such a state of affairs is likely to happen in a large and busy African port which is constantly receiving from other ports ships in quarantine on account of plague.

The same difficulty obviously applies to fly breeding with this small difference, that whilst we can get 100 per cent efficiency in preventing rats breeding in the garbage, we cannot get the same high percentage in the case of flies, without indulging in perhaps unjustifiable expense. We can, however, reduce fly breeding to an almost negligible extent, and that by simple and relatively inexpensive methods.

In maritime towns like Seccondee, etc., in Equatorial Africa one tries to combine refuse disposal and lagoon reclamation, so that the system of refuse disposal may, to a certain extent, pay for itself in the course of time, and, in any case, immediately reduce the mosquito breeding area.

No system of dumping into shallow lagoon water will ever be made a

success, either from a general point of view, or more especially from a rat and fly prevention aspect. Such a system could be used in an emergency during the rains for periods of a few days at a time, but never for longer without danger and nuisance arising.

Assuming therefore that the refuse cannot be dumped into *deep sea water*—and this we cannot do in Seccondee on account of the surf and the cost—we are left, for practical purposes, with incineration as the only practical means of dealing with it.

As soon as one mentions incineration, thoughts immediately arise of various costly forms of destructors, all of them running into thousands of pounds to construct and to maintain afterwards. An M.O.H. advocating such costly schemes is not usually successful in his pleading. A large, permanent and costly destructor has a very great further disadvantage, and that is, that such a destructor is absolutely permanent in its situation, whilst the advancing edge of the lagoon reclamation is continually and rapidly getting farther and farther away from it.

It will then inevitably be found that the destructor is so badly sited, and so far from the edge, that it becomes too costly to transfer the by-products of ash, etc., from the destructor to the lagoon edge.

Therefore, in designing an incineration scheme for such work, one must keep mobility in mind as well as expense.

Quite apart from the latter consideration, it is clear that for African labour and management the simpler the incinerator is the better; a simple form will almost certainly, in the long run, give a much higher percentage of efficiency than something theoretically more perfect—but complicated.

It may be said that it is not possible to devise a cheap and simple form of incinerator for *large* quantities of town refuse. I can state, however, that this has been done here with the greatest ease and success; despite the fact that we have to contend with heavy tropical rain in the wet season.

The refuse that we have to dispose of consists of food refuse, sugar cane and palm kernels, garbage of all sorts with an innumerable number of tins and bottles, all mixed up together, and combined with a very high proportion of earth and sand. Some loads will contain possibly fifty per cent of sand and unburnable material in the form of grit, etc.

It will thus be seen that even a Horsfall type of destructor might not produce appreciably better results than the method I am about to describe. If all the sand, grit, etc., were put into any form of destructor it would probably be rapidly choked with the resulting clinker.

In addition to the actual incineration, one has also to consider weather protection and drying sheds for the refuse; these may be very costly to erect.

I inaugurated a simple and inexpensive form of incineration in Seccondee which has now been in use for some eight months. In devising such a scheme I had to keep in mind (*a*) cost, (*b*) practicability, (*c*) durability.

Something had to be constructed which could be worked with ease by

unskilled African labour, and which could be readily reconstructed or repaired if it became necessary to do so. It had in addition to be of such a nature that one could

(1) Move all or part of it to a new site ; or (2) reconstruct it at another site at little or no cost.

We have in this part of Africa a form of red earth, which, after being damped and puddled, is called "swish." This sets hard like a terra-cotta brick of loose texture, and is used by the native population for making houses and fish ovens.

I decided to make my incinerators out of this material as it had several advantages—

(1) The local labour understood how to make and use the material; (2) it is on the spot; (3) costs nothing except the labour to dig it.

There are thirty incinerators in use at the main dump, and these are all of the same type.

Each incinerator is made of "swish," circular in form.

Inside diameter..	3 feet
Height	4 feet 2 inches

There are two openings for ventilation on opposite sides, each the exact size of the bottom of a kerosine tin (in point of fact in constructing them a kerosine tin is built in and then withdrawn). The object of this is to enable the boys to stop the leeward hole without difficulty, as such tins are common on the dump.

The grate consists of iron bars of any convenient size or shape placed four inches apart—this distance apart is important, as, if they are too close they cannot be raked or cleaned—and one foot above the ground.

The thickness of the walls is seven to nine inches. They run straight up and down inside. They are slightly tapered in at the top outside (see sketch).

They are built, native fashion, in layers and allowed to set, and take three days to complete.

After they have dried a coating of coal tar is applied and allowed to dry, though, indeed, the incinerators *can* be used before the tar is dry. If cracks develop they are patched and tarred.

This produces a rock-hard, weatherproof structure, which stands the rain well.

It should be noted that increasing the size of the incinerator will not increase its efficiency. Rather the reverse. As I make it, the maximum draught and burning capacity are obtained.

At first we made them by hand and eye alone; this, while satisfactory up to a point, led to rather wide divergencies from standard pattern, and the workmen needed watching if uniformity was to be obtained.

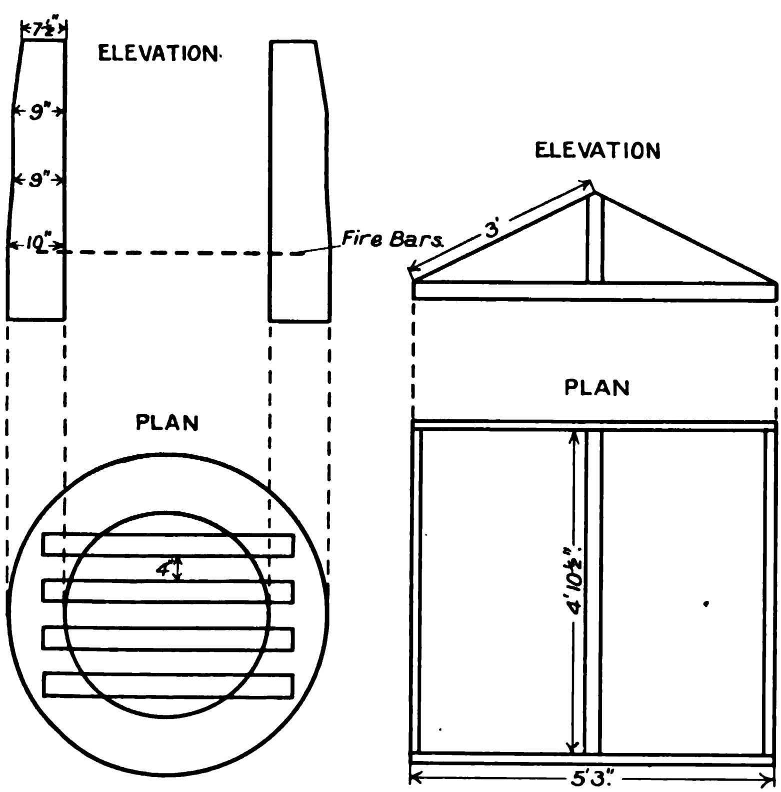
I therefore approached the P.W.D., and got them to make, on pay ment, a complete inside mould of an incinerator.

This is made out of light mahogany, in three sections, i.e., one bottom section up to grate level and two top sections. The top portion had to be divided into two, as it was too heavy to lift out in one piece.

With this mould incinerators can be built "while you wait" so to speak.

Four or more bottom sections are laid down on the first day and left to set. On the second day the bars are laid on, and the first half of the top completed; on the third day the structure is completed. It

INCINERATOR. RAIN SHIELD.



SKETCH PLAN AND ELEVATION OF INCINERATOR WITH SKETCH OF CORRUGATED IRON RAIN SHIELD.

is then given three days or so to set and dry, depending on wind and sun, after which it is tarred. The wood mould is oiled before use, and is withdrawn immediately a section is completed. The builders do not find any difficulty in doing this; they like the mould immensely, and say that it saves trouble. Its use trebles or quadruples their power of construction.

If any incinerator cracks badly or gets damaged it is simply knocked down and rebuilt at once.

The heat generated in these incinerators requires to be felt to be realized. They burn furiously, and at times their interior is just a glowing incandescent mass. The quality of the ash produced is excellent.

We had exceptionally heavy rains this year, and we carried on all through, burning refuse all the time. For some four days only, during the worst period, did we have to resort to dumping into three feet of lagoon water, and even then we continued burning refuse.

During this time the garbage coming down in the lorries was a wet, sodden mass, and most depressing to look at. Still, this state of affairs only lasted for a very short period, and now, despite the usual occasional heavy local showers, we burn with ease upwards of thirty-six Ford one-ton lorry loads per day.

I considered what might happen when the rains broke and realized that it would be necessary to provide some system of protecting the garbage and keeping it dry during the rainy periods. This has been done as follows :—

The Town Council voted me the sum of £100, and with this I constructed for each two incinerators a drying shed, made of bush timber and thatch, by specially engaged labour. Each shed stands some nine feet behind the incinerators and is placed so that the prevailing wind will blow from it to the incinerator.

The dimensions of the sheds are as follows :—

Height (*a*) to central ridge pole	11 feet
(*b*) from floor to eave	8 feet
Length	9 feet 6 inches
Width	7 feet 6 inches

The four-corner poles are sunk sixteen inches deep and the whole are braced together by cross-ties. Closely thatched roof, sides and a door are then added. The gable end on the " rainy " side is filled in; the door is also placed on that side. Thus the structure is weatherproof in time of rain. The floor is raised six inches above ground level (to keep it dry) and made of rammed and tarred " swish."

I have seen two inches of rain fall in under two hours, and with this construction there was no wetting of the garbage. The incinerators were burning during the rain, and a few that had gone out were started immediately the rain ceased.

All the " houses " are tied, the one to the other, by bamboo poles, from eave to eave, and thus the whole line of houses is a connected unit which has so far been able to defy tornados.

The width of the house has been arranged so that a one-ton Ford lorry can easily back up to the edge of the raised floor and tip its contents therein. The drivers have no difficulty in doing this.

I have now devised a protecting roof for each incinerator made out of

General View showing "Lay out."

Close up showing Rain Covers, etc.

light corrugated iron sheets, of a very simple and inexpensive type. Each consists of 2 sheets of 32 gauge 6 feet long, riveted together with an additional 6-inch strip to increase the width. These are then bent in the middle at an angle of 125 degrees and supported by a light wood frame.

In case of rain, each is just lifted by two boys and placed on the top of the circular incinerator and so completely protects it from rain. We thus have a very simple form of weather protection at negligible cost, and one eminently suited to unskilled labour. The headman at the dump is very pleased with them, as previous to their use he had to collect old galvanized iron sheets, etc., etc., and cover his incinerators as best he could.

The general principles which have made this system a success are :—

(*a*) One boy, one job and no other job; (*b*) each boy is made an expert through daily practice; (*c*) if any boy falls sick, the newcomer easily learns his job by merely imitating his companions, and is usually as proficient as they are within a few days.

There are: 15 incinerator boys who each run 2 incinerators; 5 barrow boys, 1 boy on the "travelling edge" (see later), and 1 headman constantly employed.

Each incinerator boy is supplied with: 1 digging fork, 1 rake, and 1 shovel, so that no boy has to borrow from another. This is an absolute essential.

Each one is responsible for one "house" and two incinerators and the surrounding area.

The barrow boys wheel away tins, bottles and "small stuff," each boy clearing six incinerators. They take this to the "travelling edge" (see later).

The remaining boy, armed with a rake, is stationed on the "travelling edge" and there deals with the barrow-loads of tins, bottles, "small stuff" and ash which make the "travelling edge."

We deal at this dump alone with an average of twenty-three and a half lorry loads per day, and have disposed of up to thirty-six. The garbage is familiar to any African resident; a tightly packed mass of tins, bottles, straw, refuse food, sand, palm nuts, and every other possible item of refuse one can imagine. It is covered with flies.

Each lorry is allotted a definite number of dustbins in the town. The lorry crew clear, or partly clear them, drive to the dump, "reverse in" to a "house," unload, pull out, and return for more. The incinerator boy pitches the garbage forward into the "house" if any has fallen out, so that in the case of rain he can shut the door easily. He then goes round to the front with his fork, teases and shakes the refuse, shaking out what the boys call "small stuff" consisting of sand, palm nuts, small stones and sometimes fly larvæ in large numbers. The burnable refuse is placed in baskets and put in the incinerator where it presents no further problem.

Large tins and bottles are thrown by the boy to one side and subsequently taken away by the barrow boys. A heap of "small stuff" is also gradually accumulated.

The hot burning ashes from the incinerator are taken out with a shovel, placed over the "small stuff." Alternating layers of "small stuff" and ashes thus form a heap which the barrow boys eventually remove.

The reason for thus mixing "small stuff" and ashes is that in the former there are many fly larvæ, and at first flies were prevalent at the dump. Having thought over this problem I eventually decided that the mixing of hot acrid ashes would kill the majority of larvæ and eggs. This has proved to be the case and if the mixing is done carefully the majority of larvæ are found cooked. On the other hand if the boys are careless quite a large number will survive. Thus the prevention of fly-breeding is largely dependent on this work. When it is properly done, twelve to sixteen flies per square yard is an average batch : determined as detailed below.

With regard to fly-breeding I have conducted the most careful experiments, and find that very few flies breed in the neighbourhood of this "travelling edge" if the mixing is done properly at the incinerator. I have constructed a light-tight box, 1 yard square, 6 inches deep, with a 2-inch hole in the centre, over which is placed one of the ordinary large sized unspillable ink pots with detachable central cone.

The box (taking care of course that there are no flies inside) is placed over the newly-deposited mixed ashes and "small stuff." The bottom is sealed round and the box is fastened down with sticks and wire. My theory was (and it is correct) that any fly hatching out would immediately be attracted by light, go into the inkpot and be trapped there; similar to what happens in my fly-trapped pits for excreta disposal.

Sufficient counts have not been made up to date to arrive at conclusive data.

The next step is that large tins, galvanized iron, bottles, etc., are removed to the lagoon edge and there dumped, dealing with small portions at a time. This I call the "travelling edge," as it moves forward rapidly.

The tins, etc., are flattened out, placed in layers to a depth of some 1½ feet. On top of this the mixed "small stuff" and ashes are placed and levelled, eventually forming, as is clearly shown in photograph, a closely packed floor of grey black ashes covering over the tins, etc. It becomes more and more consolidated with the daily traffic upon it. The edge of tins, etc., moves forward, is covered by ashes, etc., and moves again.

The edge at all times remains clean cut and sharp at the water's edge, except at the actual spot where the tins are being deposited. Our rate of progress forward is really amazing, and we are reclaiming a great deal of ground.

Close to where we are working there are several small islands. These islands are great breeding places for mosquitoes, and the intention is to go round the edge of each island, reclaiming it and making it level with ashes, etc., and then subsequently to fill in the middle.

Mosquitoes breed in crab-holes, and these are less frequent where the tins, bottles, etc., are covered with ashes.

The scheme is a marked success. The whole system works like a well ordered machine and the dump is an extraordinarily tidy place.

One can go there at any hour and find the refuse being deposited, sorted, burnt and ashes and bye-products taken away with clocklike regularity.

Each boy knows he has his job to do, and that except in the most grave emergency he will not, at a slack moment for him, be called upon to do any other work. That is to say the principle accepted by each boy is, if he gets on with his job and burns his garbage quickly he is not then called upon to assist some other boy who is lazy.

VIEW OF "TRAVELLING EDGE" WITH "BOYS" AT WORK.

The headman exercises general supervision and allots lorry loads, as they come in, to each incinerator or "boiler" as the boys call them. This avoids all friction and jealousy.

The boys are most happy and contented, and there is quite keen competition for work on this dump.

In general I do not claim that this system is perfection, or that a better cannot be devised, but I do say (*a*) that it is practical and does what is required; (*b*) that it meets a deeply felt want in many places; (*c*) that its first cost is negligible, as I only paid some £65 for fifteen "houses"; (*d*) that its running cost is relatively small—i.e., some £600 per annum.

A large Horsfall destructor would cost more than a thousand pounds (that in itself involving a yearly charge for interest).

It would need a skilled European supervisor (probably at a salary of

some £400 per year), and a number of labourers, which, at the present moment, I am unable to estimate.

A Horsfall, moreover, would be immobile, while it would be easy on the other hand to transfer all the "houses" intact, at a couple of days' notice, 100 yards nearer to the "travelling edge," following its forward movement. Thirty incinerators could be constructed on the new site in some twelve days by the use of the mould, or in one month by hand and eye alone.

It seems almost certain that the destruction of millions of flies' eggs and larvæ, and the destruction of rat food, are bound to have a most beneficial effect upon the general health of any tropical town.

This type of incinerator is one that is well adapted for village use, as Africans are accustomed to "swish," and any headman once shown the method could make one.

Any rat that wishes to get food at the dump must "step lively." He cannot approach the houses till dark, and he must leave early and cross a big open space. No rat will continue to do this.

By the use of these and other incinerators of the same pattern on other sites, together with my fly-trapped excreta pits, which are the subject of another article, the fly population here has been reduced enormously.

In other words, the numbers are so few as to pass unnoticed. The gain, both as regards health and comfort, is inestimable.

The very small number of flies to be seen in the municipal markets on exposed food has been a very striking feature since the inception of this scheme.

I wish to thank Dr. M. E. O'Dea, the Honourable the Director of Medical and Sanitary Services, Gold Coast, Accra, for permission to publish this article, and to thank Dr. G. Hungerford, late Acting Director of Medical and Sanitary Services, and Dr. G. J. Pirie, the Deputy Director of Sanitary Services, for the interest they have taken in this work.

Editorial.

STERILIZATION OF WATER BY CHLORAMINES.

During the late manœuvres the troops as regards water supplies were supposed to be on active service and had to make use of whatever sources were available both in camp and on the march. Some of the waters were markedly contaminated, notably the Itchen which contained presumptive *Bacillus coli* in 0·01 cubic centimetre. All water supplies were chlorinated before use either by stabilized chloride of lime, the amount of chlorine required being determined by means of the standard test case, or by chlorine gas, or by the chloramine processes recently described in this Journal by Major Harold.

Most officers of the Corps are familiar with the procedure involved in the sterilization of water by chlorine gas and by chlorine obtained from chloride of lime. The use of chloramines for the sterilization of water is, however, a comparatively recent development and before discussing the results obtained in the recent manœuvres, it may be helpful to summarize briefly our knowledge of this subject, which has been extended considerably by Major Harold's researches.

Chloramine (NH_2Cl) was discovered by Raschig in 1907, and was prepared by mixing cooled dilute solutions of bleach and ammonia in the proportion of two parts by weight of chlorine to one part by weight of ammonia. Rideal, however, was the first to notice the effect of ammonia on the germicidal value of hypochlorites. During the chlorination of sewage he found that after the free chlorine had apparently disappeared a slow germicidal action continued for several days which he attributed to the substitution of chlorine for hydrogen in ammonia and in organic bodies.

In 1915, Race conducted a number of experiments on the germicidal effect of adding ammonia to bleach solution, he found that 0·2 part per million of available chlorine and 0·1 part per million of ammonia produced as good results as 0·6 part per million of chlorine alone. During the winter of 1915-16 when the price of bleach had risen enormously, Race determined to try the mixture of bleach and ammonia on a practical scale for the purification of water. He commenced by adding pure strong ammonia to bleach solution contained in barrels, the proportion being two of chlorine to one of ammonia ; the results were not satisfactory as copious evolution of gas occurred. When, however, dilute solutions of ammonia and bleach were made and only mixed a few seconds before delivery to the suction pumps, successful results were obtained and in 1917 the process was adopted on the main chlorinating plant at Ottawa. The ratio of chlorine to ammonia was varied ; the lowest ratio was approximntely 4 : 1.

Race states that this is the ratio indicated if bleach be represented as $Ca(OCl)_2$, as only one molecule of $Ca(OCl)_2$ is produced from two molecules of commercial bleaching powder, $CaOCl_2$. The superiority of chloramine over other processes is due to the non-absorption of the germicidal agent; but to obtain the same efficiency the contact period must be increased as the concentration is decreased. At Ottawa the contact period was one and a quarter hours. There were never any complaints as regards odour or taste, although the chloramine produced by the interaction of bleach and ammonia was stated to have a more pungent odour and taste than chlorine. The most important advantage of the process was stated to be the elimination of aftergrowths from the filters. When operating the chloramine process it is essential to employ low concentrations of hypochlorite and ammonia; an excess of ammonia must be avoided, otherwise hydrazine hydrochloride, or even ammonium chloride, which has no germicidal action, may be produced. An increase of the chlorine might theoretically result in the production of dichloramine ($NHCl_2$), or the formation of nitrogen trichloride (NCl_3). Nitrogen trichloride is known and can be easily prepared by passing chlorine gas into a solution of ammonium chloride. A monochloramine solution produced by the action of bleach and ammonia has the disadvantage that lime is deposited from the solution in the pipes and facilities for removing the deposit must be provided.

The object of Major Harold's experiments was to produce a germicide which would have high bactericidal powers in water but be little affected by organic matter present in natural waters, and at the same time produce no unpleasant taste with tannin or tea extractives. We have already published a detailed account of his experimental work, and from this it would appear that by adding a solution of chlorine gas to a solution of ammonia in certain definite proportions two chemical substances of the nature of chloramine may be produced, and for their successful preparation rigid attention to certain details of procedure and concentration is essential. These compounds appear to have greater germicidal powers than chlorine alone, as they are not readily absorbed by organic matter. Major Harold has found that if ammonia and chlorine in proper concentration are mixed prior to dosage into the water to be sterilized the compounds produced are more stable, and have a higher germicidal velocity than those obtained by adding the chlorine in correct proportion to a water already containing ammonia.

The chemical substance obtained by mixing 2 of chlorine and 1 of ammonia by weight, is different from that resulting from the mixture of 4 of chlorine and 1 of ammonia; the latter has a more acrid smell and pronounced taste, while the former has a dry taste and a less distinctive smell. That there is a difference between the substances is also shown by treating the solutions with carbon tetrachloride and carbon bisulphide; the compound present when the ratio of chlorine to ammonia is 2 to 1 is not extracted by these solvents, while that formed when the ratio is 4

to 1 is soluble equally in water and in carbon tetrachloride and carbon bisulphide. As regards the chemical composition of these compounds, it is advisable to keep an open mind. Major Harold thinks the designations monochloramine for the first titration fraction and dichloramine for the second are appropriate, but there is a possibility that the second titration fraction which appears on the addition of an acid may prove to be an aqueous solution of nitrogen trichloride.

Whatever may be their exact chemical constitution, the compounds appear to give the general reaction of chloramine and possess similar germicidal powers, which is the important matter, so far as the sterilization of water is concerned. The supposed dichloramine seems, however, to act a little more slowly as a sterilizing agent than the monochloramine, though its action is more persistent.

Major Harold suggests that the following reactions are involved in the change over to chloramines :—

$$NH_4OH + HClO = \overset{\text{Monochloramine}}{NH_2Cl} + 2H_2O$$

$$NH_4OH + 2HClO = \overset{\text{Dichloramine}}{NHCl_2} + 3H_2O$$

These equations are supported by conductivity tests. The formation of chloramines does not appear to be represented by the following equation :—

$$NH_4OH + Cl_2 = NH_4Cl + HCl + H_2O$$

If HCl were formed there should be marked rise in the conductivity figure, but Major Harold did not find this to be the case.

When mixtures of bleach and ammonia are made the results are much the same as when solutions of ammonia and chlorine gas are employed ; but when the ratio of chlorine to ammonia is four to one, although there is an increase in the second titration fraction, dichloramine, the combination produced is not so well defined. This is probably due to interference by the base (Ca).

In military practice it is the custom to clarify waters by filtration through an alum precipitate deposited on a special cloth ; this removes about sixty-six per cent of colloids present in the water, but nitrites, soluble organic matter and non-strainable colloid may still be present. These cause a rapid absorption of chlorine, but chloramines appear to be unaffected, and in this respect the chloramine process has a marked superiority, as much less of the chemical is required to produce the same germicidal effect. In practice it has been found that one part per million is sufficient to sterilize a water even when it is so polluted as to be almost undrinkable. Usually a much smaller quantity, i.e., 0·25 or 0·3 part per million, is sufficient for waters likely to be used by troops on service. Chloramines in the amounts ordinarily used do not give rise to taste troubles. Race states there were no complaints at Ottawa, and at Aldershot during the last two years no taste troubles have been encountered. Chloramines

are also dissipated by heat, and tea made with a treated water is quite free from the nauseating taste which sometimes appears when chlorinated water is used. It seems probable that when proteins present in water are decomposed by bacterial action substances of the nature of phenol are produced, and when small doses of chlorine are being used the phenol bodies and chlorine combine to form substances which have a peculiarly nauseating iodoform-like taste. When larger quantities of chlorine are employed the oxidizing action comes into play and the bodies resulting from protein destruction are then oxidized and taste troubles no longer appear.

Recently Adams has shown that rain water collected in the neighbourhood of towns, especially when the atmosphere is smoke-laden or fog is present, may contain minute quantities of phenol bodies which in the presence of small quantities of chlorine give rise to an iodoform taste. The phenol may be only one part in 1,000 millions and the chlorine not appreciable by O-tolidine test, and yet the taste of iodoform can be detected. Thresh and Houston have obtained similar results and the latter points out that river water polluted with the waste water from towns is likely to contain traces of phenol bodies. The iodoform taste is prevented by superchlorination and by the presence of considerable quantities of organic matter. Adams also found that if he added small quantities of ammonia to the water before the dose of chlorine, the iodoform taste did not develop; this result is of peculiar interest in the light of Major Harold's researches.

Turning now to the report on the manœuvres, it is distressing to read that once again the regimental water-duty men failed to carry out the simple procedure required for the ordinary standard process of chlorination and it was not until the R.A.M.C. men took over the work that complaints ceased. It would appear that the men in a regiment take out several courses and when the unit goes on manœuvres the more intelligent men are employed on strictly military work rather than on water duties. From September 4 to 7, the water was treated with stabilized bleaching powder, employing the test case to determine the amount of chlorine required. On the evening of September 7, the use of bleaching powder was discontinued and all water was treated with chloramines by the R.A.M.C. Staff of the Army School of Hygiene. The dose of monochloramine varied from 0·3 part per million up to 1 part per million. The large dose of 1 part per million was required for the Itchen River, which was markedly contaminated, but after treatment no presumptive *B. coli* were found in 100 cubic centimetres. Even with this dose there were no complaints as regards taste, and tea made with the treated water was quite palatable. Dichloramine was equally effective but the dose required was smaller. It was thought that dichloramine was a little slower in its action, but had a superior germicidal effect in the presence of nitrites and easily oxidizable organic matter, such as fresh urine.

The secret of success in making chloramines by the interaction of a solution of chlorine gas and a solution of ammonia is to have a definite

concentration, and after very many experiments Major Harold discovered that the optimum concentration is about twenty-five parts per million of chlorine. In the case of monochloramine, this is obtained by filling the kettle, which forms part of the water-cart equipment, with clarified water, adding one tablet of ammonium carbonate, previously dissolved in water placed in one of the cups of the test case, and then pouring into the ammoniated water, one measure of chlorine gas solution from the sparklet bottle. After a few minutes the contents of the kettle are poured into the water-cart already filled with clarified water and the strength of chloramine in the water-cart then varies from 0·8 to 1 part per million, according to the level of water in the cart.

The procedure is extremely simple and after two demonstrations the water-duty men of the 2nd Brigade were able to carry out the work to the satisfaction of all concerned.

Dichloramine solutions made in the various ways mentioned in the report were tried experimentally by the R.A.M.C. Staff of the Army School of Hygiene.

The drawbacks to the process appear to be few and should be got over by further experience. They are partly details of manufacture. The chlorine gas in the bulbs must be dry and the quantity accurately measured; the bulbs originally supplied were excellent, but in some of the later supplies the packing was not quite satisfactory. The ammonium carbonate tablet deteriorates on exposure to the air: there is an actual loss of weight by volatilization and a loss of ammonia by gradual conversion into hydrogen ammonium carbonate. This defect can be got over by specifying hydrogen ammonium carbonate instead of normal carbonate. Major Harold suggests a tablet weighing one gramme, which if up to weight is within the limit of safety, i.e., less than two equivalents of ammonia, and if old will still contain sufficient ammonia to form the second fraction, dichloramine.

Another point which requires consideration is—are we quite sure that chloramines are sufficiently stable to produce their germicidal effects in all naturally polluted waters? Most polluted waters are neutral or alkaline; but is it possible for river waters containing effluents from manufacturing processes to be sufficiently acid to prevent the action of chloramines? Further experience with the process is necessary, but the results so far obtained seem to indicate that waters likely to break up chloramines will be very rare indeed. Harold has used chloramines successfully in a river water having a pH of 4. Again, the stability of chloramines is a function of temperature as well as of concentration, and Race states that it will be advisable to determine in the laboratory the maximum concentrations that can be used at the maximum temperature attained by the water to be treated. It would be of great interest to have the chloramine processes suggested by Major Harold carried out in India, Palestine and Mesopotamia, and to observe the effect of storage of chloramine-treated water in tanks during the hot weather in those countries. We believe the chloramine

process will survive the tests; but until we have a little more knowledge of the effect of tropical temperature and the action of trade effluents on chloramine, we think it would be wise to retain the test-case and the old procedure for use in special circumstances.

ARMY LIST.

Many senior officers on opening the January "Army List" will view with alarm, and it may be with despondency, the removal from the Corps List of the names of General Officers and Colonels removed from the Corps and still on the active list.

This innovation has become, after long consideration, the settled policy of the Army Council, and it will be noted that it is applied to the Army as a whole and not to the Royal Army Medical Corps in particular.

It was always illogical that officers removed from their regiment or corps should be shown in the regimental or corps lists, as well as in the gradation list of general officers and colonels on the active list in pages 150-170. They will still of course continue to be shown in the latter list, and the change merely emphasizes the fact that the officers concerned are actually removed from the corps and take their rank and precedence in the Army only.

At the same time there will occur a certain amount of inconvenience in that colonels take their seniority in the gradation list according to the date of their brevet rank, if such rank is or has been held. In order, therefore, to assist in dispelling this inconvenience for those officers to whom the matter is of interest it is proposed in future to publish in the Corps News Supplement of the Journal of the R.A.M.C. once a quarter a list of general officers and colonels (late R.A.M.C.) showing the dates of promotion to substantive rank, as these dates only count for promotion or relegation to half-pay. The stations at which these officers are serving will still be found in the War Office and Command Lists at the beginning of the Army List.

The list of the names of General Officers and Colonels removed from the Corps and still on the active list is published on the first page of the *Corps News Supplement* for February.

Clinical and other Notes.

NOTES ON A CASE OF INTRATHORACIC NEW GROWTH.

By Major C. W. BOWLE.

Royal Army Medical Corps.
Surgical Specialist, Northern Command.

The patient, aged 24, a soldier of the Northumberland Fusiliers, was admitted from Newcastle on January 6, 1925, with a diagnosis of N.Y.D. lung, sarcoma? The notes on the case were accompanied by an excellent radiograph.

The patient had been hit by a full-sized brick thrown at him by a native during a fracas at a railway station in India on November 14, 1924, whilst boarding a troop train for home, which caused a bruising of the front of the left side of his chest. He did not report sick.

On his way home on the boat he reported sick with a swelling over the ribs below the left collar bone and a pain down the left arm.

On admission to York Military Hospital on January 6, 1925, the patient was found to be a very well developed man. He complained of a swelling about the size of a dessert spoon over the second rib on the left side about 2½ inches long in the long axis of the rib and 2 inches broad and about 2 inches from the left edge of the sternum. It was tender to touch and did not pulsate. There was dullness on percussion over both the front and back of the chest with absence of normal breath sounds. A few rhonchi were heard. There was some enlargement of the axillary and supraclavicular glands on the left side, together with shooting pains and numbness down the left arm. There was also considerable expectoration of tenacious mucus, the patient giving a history of chronic catarrh for years back, in India and at home. Sputum, negative to T.B., pulse 80, temperature normal. No history of venereal disease.

The radiograph showed a dense shadow the size of two fists, completely filling the left apex of the pleural cavity. The tumour did not appear to be connected with the ribs. The right side of the chest appeared normal.

This case aroused a very considerable amount of interest amongst the hospital staff as regards the diagnosis.

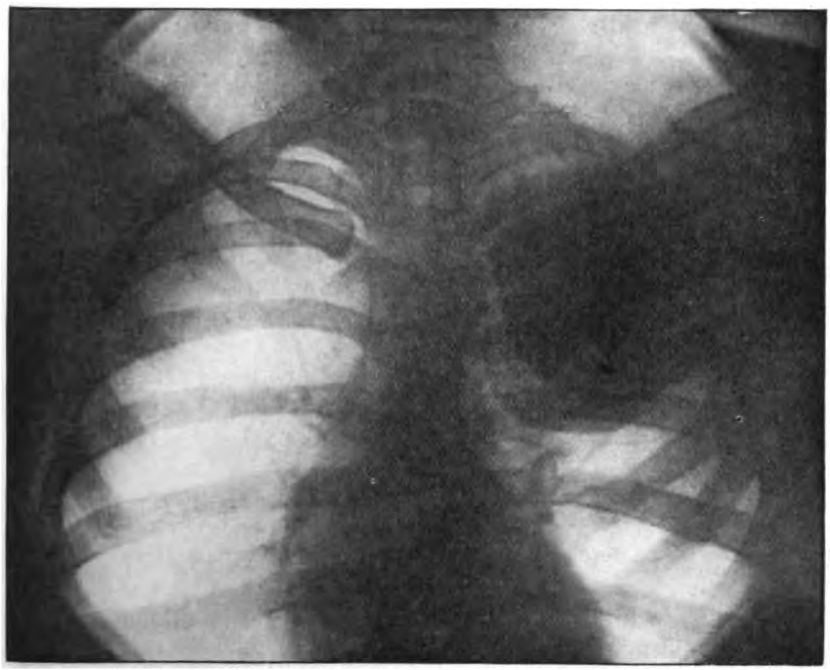
The alternative diagnosis to malignant new growth apparently lay between :—

(1) Fractured rib with a large ossifying hæmatoma reflecting the pleura from the ribs and filling the apex of the pleural cavity together with hyperplasia of the axillary glands.

(2) Abscess, with glandular enlargements. In support of this there was an occasional rise of temperature to 99° F. The differential blood-count was found to be 73 per cent neutrophiles, 23 per cent lymphocytes,

2 per cent eosinophiles, 2 per cent large mononuclears. It was decided to aspirate the tumour and so determine its constitution, 10 oz. of unaltered blood of a venous character were withdrawn with no difficulty. The patient appeared to be considerably relieved by this operation. Respiration 24/28, temperature normal. Pain down the arm lessened. A radiogram showed the shadow still present with a possible diminution in density.

About fourteen days after the aspiration it was noticed that the left pupil was considerably contracted, pain down the arm became worse, necessitating morphia. The chest tumour enlarged rapidly and blue veins coursed over it in a tortuous manner.



On February 13, 1925, the Consultant Surgeon was asked to see this case and exploratory operation was decided on forthwith.

A 6-inch incision in the direction of the fibres of the pectoral muscles was made over the tumour of the chest. Portions of a friable tumour were removed exposing eroded rib, some pus-like hyaline fluid escaped when exploring in the direction of the axilla. At the floor of the excavated masses between the intercostal spaces, a hard resistant intrathoracic mass was felt which it was considered precluded further operative interference. Considerable hæmorrhage was experienced and with difficulty controlled. Two disintegrating glands were removed from the axilla and the wound was sewn up.

After the operation the patient was anæmic; he coughed up large

quantities of bloody sputum. Temperature rose to 101° F., pulse 100/120, and respiration 24/30. Pain down the arm became worse daily. A tumour of elastic consistency was noticed on the forehead on the right side; this tumour increased very rapidly in size, indeed it was possible to watch its daily growth.

Patient now complained of loss of power in the right leg, together with difficulty in micturition. Within three days both legs and the bladder became paralysed, together with abdominal stasis and complete anæsthesia below the umbilicus. The operation wound had healed in ten days, but there was brawny hardening and increased involvement of the supra-clavicular glands and axillary glands with œdema of shoulder and neck. Breathing became rapidly embarrassed and patient died with signs of œdema of lungs on March 5, 1925.

Portions of the growth removed at the operation were submitted to the Royal Army Medical College and the report given below was received:—

Post-mortem Examination.

Body of a well nourished adult showing healed scars in the left pectoral region, the result of recent surgical operation. A diffuse, brawny, indurated swelling of the subcutaneous tissue was seen and felt in the same region, extending also outwards into the axillary and upwards into the supra-clavicular regions.

Another well-defined subcutaneous swelling, about the size of a tangerine orange, over which the skin could be moved freely, was present in the upper right frontal region. No other sign of disease noted externally.

Thorax.

On removal of the sternum and adjoining costal cartilages, a left-sided pleural effusion of about one-and-a-half pints of clear straw-coloured fluid was found. The superior mediastinum was found to be completely filled with a large solid lobulated mass of growth and continuous with a similar mass of pinkish white growth in the upper part of the left thorax and completely obliterating any signs of lung tissue in this situation.

On further reflection of the pectoral muscles, together with the skin and subcutaneous tissue of the left side, the mass of growth noted above was found to be continuous with a similar new growth found outside the thorax. The second left rib and the intercostal muscles of the spaces above and below the rib anteriorly were found to be incorporated in the growth, and there was very little normal bony rib tissue to be found for an inch or two lateral to the costo-chondral junction.

The pectoral muscles were also extensively infiltrated, and the growth was found to extend in a continuous mass into the axilla as far as the axillary vessels and cords of the brachial plexus and also upwards into the supra-clavicular region.

On examining the left lung *in situ*, the lower lobe and the lower part of the upper lobe, unaffected by the growth, were found to be in a collapsed state. The apex and upper part of the upper lobe, laterally and posteriorly were adherent to the chest wall by pleural adhesions. As already noted, the lung anteriorly was completely obliterated by new growth and medially it was not possible to separate the upper lobe from the supra-mediastinum on account of the continuity of the growth in this direction.

The right lung was found to be normal, with the exception of a small secondary nodule situated near the anterior margin of the lower lobe.

On removal of the lungs the new growth on the left side was found to consist of a large mass of softish, pinkish-white or yellow, semi-friable material, with bands of fibrous-looking tissue disposed in a radiating manner throughout the mass. The lung tissue of the upper anterior aspect, as well as the apex of the left upper lobe was found to have been invaded and almost completely replaced by the growth, a small portion of the lung remaining posteriorly.

Secondary deposits of new growths were found in the following situations :—

(*a*) Right lung, as noted above.

(*b*) Inferior margin of right lobe of liver.

(*c*) Spine in the neighbourhood of the tenth dorsal vertebra.

(*d*) Scalp, in the upper part of right frontal region.

The secondary deposits in the lung and liver were small rounded nodules situated superficially. The deposit in the frontal region was found to be a rounded, whitish, soft mass, not adherent to the skin, and easily shelled out from the scalp tissue, but adherent to the underlying bone by a small pedicle or stalk. On removal of the portion of the bone affected, by trephining, the pedicle or stalk was found to have grown through the bone, and on subsequently removing the skull cap the growth externally was found to be connected with a similar growth internally involving the dura mater.

The growth in this situation was more or less flattened and diffused and covered an area of about one and a half inches in extent. The under surface showed one or two nodules growing downwards toward the brain, depressing, but not involving the latter. The deposit in connexion with the spine was seen to form a small swelling from within the abdomen on the left side of the spinal column and between the posterior ends of the ninth and tenth costal arches. On dissection the tumour was found to consist of the same white, softish material noted in the other secondary deposits, and to be growing outwards from an intervertebral foramen along the course of the spinal thoracic nerve. The bodies of the vertebræ and surrounding bony structure appeared to be healthy. No other secondary deposits were found elsewhere. The spleen, pancreas, and kidneys and gastro-intestinal organs were all found to be healthy with the exception of the appendix, which was bound to the cæcum by old adhesions. The

pelvic organs were normal and no abnormality was found in the brain, with the exception of the growth in the dura mater, already noted.

Report from the Royal Army Medical College.

The following are the conditions found in the three portions of tissue submitted for examination.

(1) This consists in the main of a fairly dense fibrous stroma, throughout which are scattered sheets of cells mainly of a polyhedral shape, and strongly resembling the cells of the deeper layers of the epithelium. The nuclei of these cells are large, rich in chromatin, and in a fair number of cases show mitotic figures.

At certain points the arrangement changes. The fibrous tissue becomes less dense, and is arranged in a meshwork of strands. The spaces thus formed are lined with endothelium, and in these spaces are collections of cells which are more loosely arranged than those in the first part described. The majority of these cells are round with scanty cytoplasm and dense nuclei, resembling a lymphatic type of cell. Cells of the polyhedral type are however also present in these spaces, and show a tendency here and there to be arranged round small light-staining circular collections of cells like tiny "pearls" or "cell nests."

In some places the polyhedral cells have an alveolar arrangement, with a core of the round cells.

(2) This shows a portion of muscle being invaded by the new growth. The infiltration is intense. The cells are in some parts spindle-shaped, with comparatively light staining nuclei. In other places quantities of the round cells are massed together. There is a tendency towards the arrangement of the cells in whorls. A fair amount of hæmorrhage is present, and blood-vessels are of a primitive type. In places quantities of deeply stained fibrin are to be seen.

(3) This has the external characters of a gland as suggested, and presumably is a gland, but no typical tissue by which it may be definitely labelled as such is left.

It consists of a reticulum of loose fibrous tissue, forming a meshwork, the spaces of which are lined with endothelium.

Hæmorrhage is a conspicuous feature, having taken place partly into the substance of the fibrous tissue, and partly into the endothelium-lined spaces.

The spaces are in the main, however, filled with plugs of cells of the two types described. The largest plugs are of the small round cells, but there is no lack of small plugs of the polyhedral cells. In some places the plugs are lying quite free in the spaces. In other places the dissociation from the endothelium is not so conspicuous. Some of the plugs consist of both types of cells intermingled.

CONCLUSIONS.

(1) There can be no doubt as to the malignany of the tumour. The type of cell, the invasion of muscle, the glandular involvement, the hæmorrhages and the vessels are all sufficient to make that point quite definite.

(2) The origin of the tumour is by no means so definite. Taking the first portion of tissue described as representing the tumour mass, the amount of stroma, the type of the cells, and the masses of cells lying in the spaces are by no means suggestive of sarcoma.

The epithelial type of the cells, the general distribution, the stroma formation are all suggestive of carcinoma. On the other hand the situation of the tumour, in a locality where there is no epithelial tissue, and the absence of any primary focus in epithelial tissue, leaves this very doubtful.

There remains the possibility of an endothelioma.

Muir says that if growths having the structural arrangement of a cancer occur in regions where there is no epithelium, one may be justified in using the term endothelioma in reference to them. Borst describes a case originating in the pleura, which penetrated the chest wall. In this "pearls" were present, and the cells strongly resembled epithelial cells. Ewing casts doubts on this being an endothelioma. In the present case the nuclei have certainly not the vesicular character common in endothelioma. Nevertheless it seems most probable that this tumour is of the nature of an endothelioma, probably taking origin in the pleura and penetrating the chest wall.

A radiogram showing the dense shadow of the growth accompanies these notes.

A rough sketch in oils of the lungs was made after removal at the post-mortem examination.

This case is considered of interest on account of :—

(*a*) The comparative rarity of the disease.

(*b*) The great rapidity of the growth of the tumour, and especially the rapid growth of the secondary deposits.

(*c*) The question as to whether the cancerous growth was caused by the blow by the brick.

(*d*) The difficulty in detecting the site of origin.

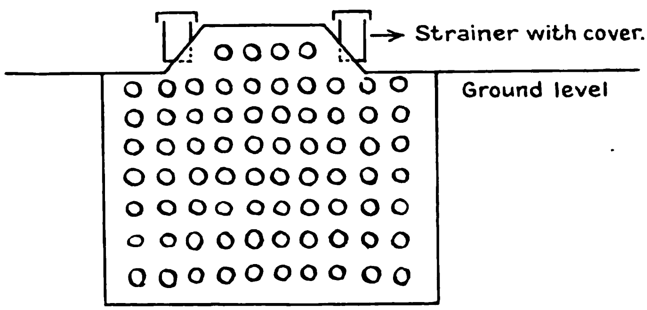
My thanks are due to Colonel F. J. Brakenridge, C.M.G., and Lieutenant-Colonel J. H. R. Winder, D.S.O., for permission to publish this case, and also to Captain J. S. K. Boyd, for his very interesting pathological report, and to Major E. G. Anthonisz, for his report on the post-mortem findings.

SOAKAGE PITS—SUGGESTIONS.

By Major J. J. D. ROCHE.
Royal Army Medical Corps.

A soakage pit unprovided with a grease trap, but fitted with the usual type of strainer, consisting of a perforated biscuit tin in which straw, etc., is inserted, in theory should cease to function after a short period.

A type, many of which have functioned for six years and over without being dug out, is illustrated diagrammatically:—



This kind differs from those commonly used by (1) having a raised platform made of stones covered with mud; (2) having tin boxes let in as strainers at the centre of each of the four sides; (3) each side being used in turn, so that after one day's use it has three days' rest; (4) the arrangement of the platform possibly providing aeration, hence probably leading to better development of aerobic bacteria in the upper layer of stones.

It is suggested that a soakage pit functions in much the same way as a contact filter or bacterial sewage bed, i.e., that suitable bacteria grow on the surface of the bricks, stones, etc., and break up the very small solid particles which normally would tend to block up the pores of the soil.

The type illustrated above was used by Indian troops, who waste much less grease than British. For the latter, grease traps should be provided.

Assuming that the pit is really a bacterial bed, it would be advantageous to study it from a scientific point of view.

The main points to be considered are as follows:—

(1) The pit should be a closed one, as the temperature in it would be higher in winter and more constant throughout the year, hence more suitable for the growth of bacteria.

(2) Is it advantageous to construct a soakage pit so that part of it is above ground level?

(3) What size per company is most suitable? (It is possibly better to express this as a certain size per 100 gallons of fluid to be disposed of.)

(4) Is it better to provide one large pit or several small ones?

(5) If a large pit is provided, should there be one or more strainers? If the latter, what are the best sites for fitting?

(6) If several small pits are provided, is it advantageous to use one each day?

(7) Is one large pit, fitted with a trap at each of the four sides and each used in turn, as satisfactory as several small pits.

(8) What material is the most suitable for the growth of bacteria, i.e., stones, clinker, old tins, bricks, or sand, or is a combination of stones and sand arranged in layers more advantageous? It is suggested that bricks become odoriferous after being in use some time, hence are unsuitable.

(9) Whether any special arrangements to obtain intermittent flow are necessary?

(10) What is the most satisfactory depth and width?

(11) Is the present nomenclature satisfactory? Absorption or soakage pit suggests mechanical action only.

Travel.

COLOGNE, PAST AND PRESENT.

By Major J. S. HUDSON.
Royal Army Medical Corps, T.A.

When the British Army marched into Cologne on that memorable day in December, 1918, how many of those present gave one single thought of what the city really was, and had been?

Even now there are many members of the Occupation who know next to nothing of its past glories, its past tragedies, its previous occupations, its buildings and its churches.

Although we have been here now for over five years, there are I believe many still whose sole knowledge of the place is limited to the "Dom" square. Having known the city for many years, it has been suggested to me that an article on the past and some of the present conditions may prove of interest to those who have been members of the Army of Occupation. It is one of the most noted cities in Europe, to which all travellers come to trade from all parts, so that there is an enormous fleeting population within its walls, not found to the same extent in other places.

The name Cologne is derived from the Latin word "colonia," meaning colony, but in course of time this meaning has disappeared, and it appears

that for centuries "colonia" has been turned into "colonus," a farmer, thus the "Kölnischer Bauer" (Cologne peasant), and the "Kölnischer Jungfrau" (Cologne maiden), have been adopted as typical of the city, and often used as a coat-of-arms. To-day we find engraved on one of the city gates:—

> "Hüte dich, Tochter des römischen Rich,
> Geistlich und weltlich buhlen am dich."

COLOGNE CATHEDRAL.

(Beware, O daughter of this Roman realm, thou art sought after both spiritually and worldly).

Glorious though the history of the city may be, yet, when we read about its past fights, past conquests, past tragedies, we find that it is stained with blood.

About the year 50 B.C. Cæsar reached the Rhine, and Agrippina, the daughter of Germanicus, who married the Emperor Claudius, founded Colonia Agrippiensis. After the Franks had shattered the Roman power in A.D. 355-462, Cologne became the seat of the Riparian Franks and later the residence of the Kings of Austrasia. Under Charlemagne the bishopric was ruled by Hildebold, who was eventually made an archbishop; the city thus became of great ecclesiastical importance, and learning reached a great height in the twelfth and thirteenth centuries, when the famous Dominicans (Albert Magnus, Thomas Aquina, and the Minorite friar, Duns Scotus) taught there. Although the seat of an archbishop and a powerful elector, there was a blood struggle for freedom against them, and in those days the archbishops themselves took part in the wars and strifes.

There is a tomb in the cathedral of one of these archbishops, who sleeps there in his full armour. Perhaps he is one of the most noted, for he attempted to take the City of Zons (now a small village some fifteen to twenty miles away), was defeated and kept prisoner for a year, being forbidden to remove his armour the whole of that time, with the exception of taking off his visor at meal times. He must have been a hardy, tough man, for when released he returned and again attacked Zons, this time with success.

The city became more holy in 1164 when the skulls of the three Magi were brought in. To-day they rest in the cathedral, formerly in a beautiful silver-gilt shrine. This, however, has now been removed, and no one with the exception of the archbishop and one other knows where it is hidden. Fear of its being stolen is the cause of its removal.

With such a history of the past one is not surprised to find innumerable churches of the Roman faith within its walls. The great majority of the Army of Occupation pass them daily without troubling to enter, except perhaps the Dom. This building predominates the town, being situated on a hill in the centre of the city, where the Temple of Mercury probably stood. It is a beautiful piece of filagree work of Gothic architecture, the first foundation stone of which was laid in 1248. With such a history we are not surprised to find that there are many legends. The one of the Dom is, that a certain monk was told to design a cathedral which would surpass all others; pondering over this he was approached by the devil in disguise, who promised him the plans in exchange for an agreement which he would not name. The following day when the devil came with the plans the monk snatched them out of his hand and ran off, the devil calling after him: "This time you have defeated me, but your name will never be known." There may be no truth in this legend but the fact remains that the name of the original architect is unknown.

The Dom was finally completed in 1880. The main objects of interest are the skulls of the Magi, a famous picture by Stefan Lochner, "The Adoration of the Magi," and some good carvings in the choir. According

to my idea the former solemnity of the interior has been spoilt by the installation of numerous electric lights around and down the columns.

One of the most interesting churches is St. Gereon; on the way to it one passes the site of the former Dominican priory, now built over by the post office and the Archbishop's palace, formerly Napoleon's headquarters when he occupied the city.

According to tradition, St. Gereon is built on the site where he and the Theban legion were massacred in A.D. 286 by Diocletian; and Helena, the mother of Constantine, built the church on this spot. Probably there is some truth in this legend, for inside the church there are innumerable skulls and bones, which one believes are those of the martyrs of the legion.

St. Martin's, Cologne.

The church is built in three different periods, thirteenth, fifteenth, and seventeenth century work. The thirteenth century crypt is most beautiful, and here as well as in the sacristy there are well-preserved early mural paintings. In addition there are some fine pieces of wood carving, one of which represents the Empress Helena.

From here one retraces one's steps to the Church of St. Ursula, behind the Archbishop's palace. We find a little bit of English history in this church. Somewhere about the twelfth century, or perhaps even earlier, St. Ursula, the daughter of an English king, decided to wed the church in preference to marrying the son of a heathen king. She set sail from England with 11,000 virgins and eventually arrived at Cologne, where

she met an angel, who instructed her to proceed to Rome and again return to Cologne, where she would find everlasting peace. She obeyed, and on her return down the Rhine was met by the inhabitants, and she and her virgins were put to death. Apparently this caused the inhabitants of Cologne some compunction, and they erected a church, where St. Ursula now rests in a fine marble sarcophagus surrounded by the bones of her virgins (in reality 1,700). There is truth doubtless in the legend, for close examination of the skulls show that they are bones of quite young people and probably girls. There are two quaint pictures in the church depicting these children being put to death with swords and arrows, but apparently from the look on their faces rather enjoying it. To further commemorate this slaughter the city adopted as a coat-of-arms a shield showing three crowns, representing the three Magi, and beneath eleven tongues of flame representing the 11,000 virgins.

The next church worthy of a visit is the Apostles, in the Neumarkt. Half way up the Neumarkt a sixteenth-century house is passed, and from a window on the top floor are to be seen the heads of two white horses. Legend states that when the plague was prevalent in the city the wife of the owner of the house, Richmodis von Aducht, fell ill and, presumably, died. She was taken to the Apostles Church and during the night thieves opened her coffin to steal her rings. However, the medical officer in charge of her case had made a mistake, for the lady was still living, and the thieves flying in alarm left her free to go home. On knocking at the door her husband, Mengis, replied to her demand to enter that he would rather believe his two white horses would walk upstairs than his wife return from the dead. At that moment the horses were heard running up the stairs, where one sees them to-day looking out of the window. The true explanation of the horses' heads is that they were the arms of the von Aducht family, and the house, like many others in Cologne in that period, was called the house of the white horses, the heads being placed there as a sign.

Proceeding up the Neumarkt the Apostles Church is reached, a Romanesque basilica of the twelfth century, now restored. It is noted for its modern and very beautiful mosaics, designed by Stummel, of Kevelaer, which cover the greater part of the nave, and the entire chancel, choir and lofty dome. The two beaten-brass altar pieces are also worthy of note, and the general lighting effect which one gets, even on a dull day, is marvellous.

There are many other churches of note in the city, which would take many days to see and many pages to describe, but St. Maria in Kapitol is well worth a visit. It stands on a hill in the historic ground where 2,000 years ago the Roman Capitol stood. It is the most ancient church in Cologne, and it is said that the foundations stand over an ancient heathen altar.

Apart from the churches, there are still remaining some interesting ancient buildings, the chief of which is the Rat Haus, or Town Hall, which was built from the possessions of the nobles who were forbidden by the

Senate to enter the city (1407 to 1414). The Hansa Hall is specially worth attention, for the name recalls the assembly of the Councillors of the Hanseatic ports in November, 1367, at which meeting the Cologne Confederation originated the victorious campaign of the North German towns against Denmark, establishing the predominance of the Hansa in the Baltic. Another room of interest is Committee Room 29, the walls of which are hung with Spanish leather tapestry. The Rat Haus is the headquarters of the Burgomeister who governs the city. He directs the entire affairs—police, sanitation, food supply, hospitals, etc.

Apart from the various buildings many of the streets are of great interest, some being named after Roman times, the Ehrenstrasse, the street of honour, leading to the Obenmarspforten, upper Mars gate, which leads down to the river and the spot where the Romans first bridged the Rhine, close to the present suspension bridge. Some are named in ancient Platt Deutsch, e.g., Perlenfuhl (the pearl mare); two streets still bear French names, placed there in 1794 when the French were in occupation. One street bears the name of Unter Gottesgnaden (under God's grace), possibly owing its name to the fact that the plague or some disease was arrested at this spot.

Formerly the city was quite small and surrounded by walls, portions of which still remain, with gates at intervals, three of which are still preserved, and are now turned into museums which contain many interesting pictures and ancient weapons of old Cologne.

Within the last forty years Cologne has increased considerably in size, and innumerable improvements have been, and are still being made. Formerly, the Dom Square was a mass of houses surrounded by narrow smelly streets (the inhabitants confessed to seventy-two distinct smells). The Ring streets, really outside the city walls, were commenced about the year 1882 or 1883, and the wealthy citizens resided there. Gradually, however, they have migrated to the suburbs like Marienburg, leaving the large houses to be taken up as business premises. A few years before the war improvements took place, including the replacing of the iron railway bridge over the Rhine by the present Hohenzollern Bridge. The railway, which entered the city on the street level, was raised to its present height, and traffic was not suspended a single day during the alterations.

A University was founded in 1389, but when the Elector, Max Franz, founded Bonn University in 1786 Cologne lost some of its importance and the University was closed in 1815. Recently it has again opened its doors, and we see the students walking about the town to-day in their coloured caps of all shapes, and sometimes bearing on their faces the recent results of their duels.

As duelling is a custom which appears to be falling into abeyance, a short description of the student's life and a description of a duel may be of interest. The young boy when he leaves school proceeds as a rule to the University where his father has been before him. He is met on arrival by

some members of the Corps, and Burschenschafts as well as Vereins, with a view to seeing if they can persuade him to join their Society. As a rule he joins the one his father was attached to or where he knows some other member. The Corps students are mostly wealthy and recruit members of royal houses and the sons of wealthy men of good position. The Burschenschafts are composed of students whose fathers are in a profession or business, whilst the Vereins recruit members who wish to be more or less independent and who do not want to make duelling a practice like the two former, amongst whom it is obligatory. These different societies have each their own colours and have a meeting place, or, as it is called, a Kneipe, where they meet two or three times weekly, sing songs and drink beer. Their life is very pleasant and their meetings do not end in drunken brawls, which many have been led to suppose they do. On the contrary, the better class societies train the students very carefully, and if he goes to excess he is severely reprimanded by the senior members, who sit in judgment on him. After the student has been a few terms at one University he moves on to another, where some special teacher may happen to be whom he desires to hear. The final doctor exam. can be taken at any University, and this is followed later by a Staat's exam., and the fully qualified man is then either doctor of law, medicine, or chemistry, etc.

The Corps and Burschenschafts, in addition to training the young student also compel him to fight a certain number of duels. About once a month these societies meet their own people, in some room, or in the summer in a secluded spot in the hills and woods, and have a morning of duelling. The combatants are first thickly padded round their fighting arms, a thick pad wrapped round the throat and chest, and iron goggles placed over the eyes, they are then given a sword with a long blade, razor sharpness on both sides, and guarded hilt. The two combatants are then placed facing each other, with legs apart, and from this position they must not move. The sword arm is raised above the head, elbow bent at right angles, for the fencing is all done with the wrist. On the command from the seconds, "Auf die Mensur bindet die Klinge," the blades are crossed, quickly followed by "gebunden sind" and "los," and the combatants at once vigorously attack each others' faces. Presently a wisp of hair or streak of blood appears on the face or scalp, the seconds knock up the fighters' swords with their own, a medical student comes forward, sponges the wound, and if not severe enough the duel proceeds either for a quarter of an hour or till one of the fighters has lost too much blood to go on. The combatants then retire and have their wounds stitched up. This is merely a friendly affair, the opponents bearing no ill-will against each other, but at times the duel assumes a more serious nature. In this case there are no restrictions of Corps and Burschenschafts fighting each other, but a court of honour must first meet and decide whether the duel is justifiable and what weapons shall be used—pistols or sabres. In this case there is no padding of vital parts, and deaths do result at times.

The punishment consists of imprisonment in a fortress for six months, and in pre-war days the "prisoner" lived in the officers' mess. These duels, however, are few and far between, and even when they do occur it is almost impossible for a foreigner to witness them. The ordinary duel can be seen by anyone knowing a member of a Corps or Burschenschaft, but it is often a very unpleasant sight, for the combatants at the end are usually unrecognizable.

When we entered Cologne in 1918 the affairs of the city were in a state of chaos. The inhabitants feared reprisals, but gradually this feeling has worn away and to-day they accept us, or pretend to do so, as part of themselves, and make the best of the occupation. We had at first many problems to face, but by far the two greatest exist to-day, viz., (1) the criminal problem; (2) the venereal problem. With regard to the first, one cannot be surprised that the city harbours many criminals, possibly partly due to the fact that it lies on the main European lines of railways. They are, however, carefully looked after by our own police, assisted by the German police, and if caught misbehaving quickly find their way to the Klingelputz prison. Evidently they do not appreciate this residence, for numerous applications are sent in to the Commander-in-Chief for release on various grounds, the majority of which are futile.

The second problem is of equal importance. Prostitution is controlled, and a certain number of women are registered and examined weekly by the police surgeon; there are also several brothels (out of bounds to the troops), also under police control, where self-disinfection is rigidly carried out, and only a very small percentage of women are found diseased who reside in these houses. By far the greatest danger to the troops are the uncontrolled prostitutes or amateurs, who roam the town in large numbers, and with whom the men have intercourse with disastrous results. The D.P.M. carries out frequent raids and any women found in company with our men, unless they can account for themselves, are taken and examined. If found diseased, and about 30 per cent are usually found so, they are sent to hospital, and on release are given the chance of going into a reformatory, where they are taught various occupations, and situations are found for them. Owing to the large percentage of diseased women it cannot be wondered at that at one period the Wiesdorf hospital had about 300 to 400 inmates, happily reduced to-day to an average of about forty-three per week. This is owing partly to the fact that this form of luxury is more expensive than formerly, partly to the activities of the D.P.M.'s department, and partly to the men having listened to the many lectures, and thus using the blue-lamp rooms properly.

The early days of the occupation were very enjoyable, and remained so until the Mark was standarized and prices rose. In those days we had free Rhine trips on one of the big steamers, free tram rides, free railway rides, and cheap living. Although the better-class restaurants, and there are some excellent ones in Cologne, were not too well stocked, and we had

to provide our own bread, yet in time they reassumed their former prosperity and one could obtain a luncheon or dinner fit for the palate of any gourmand at a moderate price. To-day one must pay as much for a meal as one would in a first-class London restaurant.

Yet we still have our compensations in the opera, where the prices are controlled for the army, and where one hears the best operas with excellent orchestra and singing, and stage effects unsurpassed by any city. We have the surrounding country, and those who are fortunate enough to possess a motor-car can spend enjoyable week-ends up the valleys of the Ahr, Mosel and Lahn, where prices are within the reach of some of our pockets. Those whose means are less can at any rate take an express electric tram to Bonn and neighbourhood, and enjoy a few hours in a better atmosphere than we have in Cologne, and amid brighter and prettier surroundings.

I have attempted to give some idea of Cologne, past and present, but it would take too many pages to give anything like a full description.

The city has passed through so many episodes, and in all twelve periods, viz.: Prehistoric, Roman, Franken and Carolingian, Saxon and Salic Emperors (the development of the archbishops' autocracy), Crusades, Development in the Middle Ages, its Spread during the Middle Ages, the Reformation and the Thirty Years' War, its Decline and the time of the Princes' Power, under Foreign Rule, under Prussian rule, and Cologne the metropolis of Rhineland. To these twelve periods yet another must be added, viz., under English rule.

Thus we have Cologne of the past and present, a city that has passed through many episodes, being under many governments, that has possessed wealth, and will always endeavour to re-establish that wealth. The citizen says to-day that he is poor. Believe it or not as you please, but the fact remains that one sees the present inhabitants driving about in luxurious motor-cars and feeding at the most expensive restaurants. New buildings, parks and gardens are constantly being laid down, and the travel bureaus are full of inhabitants inquiring about journeys to all parts of Europe. From each of its various invasions and troubles Cologne rises ever phœnix-like from its ashes, and maintains its ancient traditions, for it still attempts to hold to the words of the Kölnischer Jungfrau :—

> **" Halt fass do Kölscher Boor**
> **Bliev beim Rich et fall sös ov sor."**
> **(Halt fest am Reich, Kölnischer Bauer,**
> **Mag es fallen süss oder sauer).**

Current Literature—Surgery.

The After-Results of Operations for Malignant Disease of the Breast. By Alan C. Perry, published in *The British Journal of Surgery*, July, 1925.—This paper is based on an analysis of the after-results of 653 cases operated on for malignant disease of the breast. Before attempting to estimate the value of operation in cases of this sort, it is necessary first to ascertain if possible how the patient would have fared in the absence of any operative treatment, and this is supremely difficult for various reasons. First the patient may not discover the growth, or at least may not seek advice till a considerable time has elapsed. Deaver gives the average history before operation as thirty months. Secondly it is known that while an acute cancer may kill a patient in six months, a slowly-growing one may persist for ten to fifteen years, and then not be the actual cause of death. Again what may be set up as a standard of cure? A true cure would be one where the patient survived the normal expectation of life after operation, finally dying from some other cause and in whom at post-mortem no carcinomatous deposits were found. This cannot be insisted on, and as first recurrences occur as long as fifteen years after operation, it seems hopeless to fix a time limit as a standard of cure.

In this article the author has determined the length of time each patient has survived operation. The operative mortality in the series was 1·7 per cent. In considering factors which might influence prognosis, the length of history is found to be inaccurate and misleading, but the age of the patient is important, as in younger cases the prognosis is not so good and recurrences are more common. In 646 cases of the series in which the age was stated, 345 were between the ages of 40 and 54. The pathological type of growth is a factor of importance, and it is of special interest to note that no deaths could be traced in cases of papillary cystic and the intra-cystic carcinomata, and that two cases suffering from carcinomatous hyperplasia died from secondary deposits, from which it would appear that this condition is definitely malignant.

In the series under review the glands were examined microscopically in the majority of cases, and it was found that only twenty-eight cases showing deposits survived for seven years or more, whilst eighty-four showing no deposits survived for the same period. On the other hand, the presence of chronic inflammation in the glands appears to favour the prognosis. It would seem that preliminary excision for diagnostic purposes some weeks before the final operation is dangerous and prejudicial to its success, whereas excision immediately before the operation may be carried out with safety. The series includes a number of patients showing involvement and even ulceration of the skin and which were clearly advanced cases. An attempt was made to ascertain the effects of X-rays as an adjunct to operation, and though it was found difficult to estimate

accurately the value of this treatment, it seems of distinct assistance in the prevention of recurrences. Owing to danger of spread to the abdominal lymph glands, growths of the lower and inner quadrant of the breast have in the past been regarded as especially dangerous. This is not borne out by this series of cases and it would seem that the actual position of the growth has little bearing on the prognosis.

In tabulating the results of cases operated on, the author has adopted the method of learning the length of time each patient has survived the operation.

A study of these tables reveals the interesting fact that while 112 out of a possible 395 or 28 per cent survived for seven years, only 86 out of a possible 365 or 23 per cent survived for eight years. In studying the effect of age on prognosis it was found that the most favourable for operation was the quinquennium 50 to 54; 40 per cent of such cases survived more than three years, with an average of 7·1 years and 20 per cent more than seven years, with an average of ten years. The analysis suggests that the menopause is followed by a period of lessening resistance, after which it again rises.

A comparison of the periods of survival of cases classified according to the pathological variety of the growth, indicates that in this series cases of medullary carcinoma, contrary to the view generally held, survived on the whole longer than cases of the scirrhous type. Definite recurrence occurred in thirty-five per cent of cases examined, and in more than half of these the recurrence was local. In fifteen per cent of recurrences the supraclavicular glands were first involved. In younger patients the recurrences were earlier, and in the older later. Local recurrences should be widely excised and prophylactic doses of X-rays given, under which treatment there is a fair hope of recovery. First recurrences in bone, the spine excepted, are rare. H. C. S.

"**Tumours of the Testicle, Teratoid Group.**" By F. Gordon Bell, Edinburgh and Dunedin. *British Journal of Surgery*. July, 1925.—Since the publication in 1885 by Paget of his classical case of "Enchondroma Testis," when the discovery of an area of undoubted cartilage in a tumour of the testis led to so much discussion in the pathological societies of the day, the classification of tumours of the testis has undergone much shuffling and reshuffling. At the present time, although there is a comparatively general agreement as to the pathological grouping of tumours that occur in the testis, it is perhaps not to be wondered at that the origin of the puzzling teratoid group is still a matter of conflicting theories.

Without claiming to indicate any vital new facts, but rather with the object of presenting the subject in a form that would help to clear up some of the difficulties attached to it, Bell undertook the study of some fifty to sixty specimens of this class of tumour, the material being obtained from the Surgical and Anatomical Museums of the University of Edinburgh, and the

Royal College of Surgeons, Edinburgh. Admittedly, the number of specimens was not great, but the investigator considered that there was an adequately representative collection of the common new growths of the testis, and to know Gorden Bell (now Professor of Surgery in the Dunedin University, New Zealand) and to have been a fellow student, is to appreciate the keenness and zest with which he would undertake the investigation. He reminds us that this class of tumour is comparatively rare—according to Russell Howard, London Hospital statistics—occurring only in 1 to 1,500 male surgical admissions.

All these tumours may be classified in two groups :—

(1) The teratoid group, the commoner of the two groups, which are here discussed, and,

(2) The germinal-celled variety, which has also been variously designated, germinal-celled carcinoma, seminoma, spermatocytoma, embryonal or round-celled sarcoma. These Bell leaves to a further communication.

The teratoid group, which includes the teratomata, includes the majority of the tumours of the testis. They are *multiple tissue tumours*, and are consequently characterized by remarkable structural variations, usually obvious to the naked eye. This characteristic accounts for the many names which have been hitherto applied to tumours of this class : for example, fibrocystic disease, chondroma, chondro-sarcoma, adenoma, osteoma squamous celled, and adeno-carcinoma, etc.

Whereas a "teratoma testis" is usually defined as a tumour composed of all three layers of the blastodermic vesicle, the derivatives being present in different degrees, and varying grades of complexity, it can be shown that in some cases only two layers of blastoderm are present, and in rarer cases only one. Bell considers that the term "teratoma" should be reserved for those cases in which are produced *adult* or fully formed structures or organs, while for the more common, less complex types, where tissue production is "abortive," and a mixture of *undeveloped* elements results, the term "teratoid" should be used.

Macroscopic Appearances.—Size : from that of a golf ball to a large coconut.

Surface : smooth or lobulated.

Consistence : varying from bony hardness to putty-like or fluid softness.

On sagittal section the tumour is often seen to have sprung from the mediastinum testis.

On section it is characteristic of these tumours to contain cystic spaces : the tumour substance may be sponge-like or honeycombed : the cyst spaces contain fluid of varying colour or even colloid, not unlike a section of thyroid, and are usually scattered through the main substance of the tumour which is evident as patchy areas of a solid homogeneous nature. The compression of the testicular tissue proper, to form a flattened fibrous capsule, often however only evident on microscopic examination, is very characteristic. Should any large amount of the corpus testis have survived

this compressing effect of the enlarging tumour, it is usually part of the upper pole, which should therefore be subject to careful scrutiny. Nodules of cartilage will occasionally be found, while hæmorrhagic areas should give rise to the suspicion that the tumour is one of the rarer chorion-epitheliomata.

Microscopical Features.—In this section, Bell draws attention to the necessity of using the "whole section" method, as taking portions of tissue at random is apt to lead to a diagnosis of simple tissue tumour, whereas a more comprehensive review would have revealed at once a variety of structure, and pointed to the correct diagnosis. The advisability of including the periphery, and looking for the compression capsule, has been stressed.

In *grouping*, the writer's own words must be used to indicate the method he suggests.

"After examining a considerable number of these tumours it is possible to reduce them to a 'group type'—as follows :—

(1) *Mesoblastic Derivatives.*—The presence of cartilage in the form of round or oval nodules or crescents is characteristic. A fibrocellular myxomatous matrix, sometimes sarcomatous in type, is also characteristic, and always suggests that any tumour under consideration is teratoid.

(2) *Hypoplastic Derivatives.*—These take the form of tubules or spaces lined by cubical or columnar cells, often suggesting adult glandular structures, especially intestinal mucosa.

(3) *Epiplastic Derivatives.*—Spaces lined by stratified epithelium, with cell nests often a striking feature.

The microscopical character of each form of derivative is then described in greater detail, the points being well illustrated with good photomicrographs.

Teratoma Testis and Malignant Conversion.—This type of tumour is usually regarded as an innocent one in which malignant changes *can* occur. Bell considers that the class as a whole is highly malignant, and that greater stress should be laid on the possibility of malignant changes occurring, especially in the hypoplastic group, where early malignant change can nearly always be found. One is reminded of the tendency especially in undescended testis. The more mature the tissue elements the less likely are malignant changes. One tissue element may outgrow the others and determine whether the malignant change shall be carcinomatous or sarcomatous.

The various types of teratoma are then described, the section being well illustrated with photographs of naked-eye appearances, microscopic sections, and even radiograms, and in each case the writer draws his conclusions, and gives reasons for putting the specimen under consideration in its group. As examples, three types are taken.

(*a*) The typical cystic variety, which should be recognized by a glance at the cut surface.

(*b*) A solid homogeneous tumour containing heterologous elements to illustrate that these tumours may well lack the classical cystic appearance.

(*c*) " Freak " varieties, such as a rodent (basal-celled) type.

Metastases.—May occur by blood or lymph stream or by both. This quite naturally depends upon the type of cell elements preponderating, the spread following the usual laws for malignant tumours of mesoblastic or epiblastic origin. Paget's case of occurrence of enchondroma in the lung, secondary to the primary lesion in the testis, would appear to be an example of the possibility of spread by direct invasion of venous channels, by a comparatively innocent tumour.

Lymph spread: Primarily to the lumbar glands, next to the intra-thoracic groups, and secondarily to brain, kidneys, etc. When the inguinal glands are involved, the scrotum invariably shows some ulceration.

Blood spread: To lungs and liver, as in sarcomata.

Age Incidence.—May be present at birth, as in case of a true " teratoma," which "grows with the growth of the patient."

Otherwise there is no very definite age incidence, but it would seem that although these tumours are common at about 20 years, also round about the fourth decade, it is possible for a tumour to appear at any time during adolescence, and not increase in size till a considerable number of years has passed, during which time it appears to remain latent. Trauma is often blamed for the appearance of the tumour. D. C. M.

Reviews.

ALCOHOL IN MEDICAL PRACTICE. By Courtenay C. Weeks, M.R.C.S., L.R.C.P. London: H. K. Lewis and Co., Ltd. 1925. Pp. ix + 186. Price 3s. 6d. net.

In this small volume of 186 pages there is tabulated and condensed the fruits of much search and compilation.

The author has studied returns from 500 medical institutions, of which 360 were hospitals, asylums, sanatoria, and others from convalescent homes in the British Empire.

He reviews the question of alcohol in medicine generally, and alcohol in the treatment of circulatory diseases and pneumonia, while his concluding pages contain a voluminous appendix dealing with the cost and amount of alcohol per head per annum in various institutions.

In his final chapter he traces the evolution of medical opinion on alcohol in practice, and quotes freely from the works of such well-known authors as Todd, Chambers and Liebig.

The subject is a sober one and has been soberly set forth. It is entirely free from the bias one associates with a Temperance Tract.

He asks the medical profession to scrutinize their use of alcohol and ask themselves one comprehensive question: " On what scientific principle shall I use or not use alcohol in this particular case, and what is the exact effect which I hope to produce if I do use it?" This is a fair question and is probably frequently put and answered by most of us who are engaged in the treatment of acute diseases.

This book contains much useful information and can be read with profit and pleasure. J. W. H.

Acute Infectious Diseases. A Handbook for Practitioners and Students. By J. D. Rolleston, M.A., M.D. Oxon. London: William Heinemann (Medical Books), Ltd. 1925. Pp. vii. + 376. Price 12s. 6d. net.

The author of this book has had twenty-five years' experience of dealing with infectious diseases, and, in addition, he has had opportunity of access to the literature of these diseases in the foreign medical press. He is thus in a position to deal authoritatively with his subject, and to give a bibliography for each disease that forms an important adjunct to the book. He does not attempt to include every infectious disease, but limits himself to those diseases which are usually treated in isolation hospitals; bacteriology and pathology are discussed, but the book is essentially clinical, and it is this aspect that receives most attention in a work that is primarily intended for the practitioner and the student.

In diphtheria Dr. Rolleston emphasizes that the administration of antitoxin must be guided by the clinical appearances, and refers to the suggestion that in every case in which it is considered necessary to take a swab a dose of antitoxin should be injected. Under some diseases one finds reference to the use of convalescents' serum, but this interesting line of advance is not definitely detailed. In connection with the prophylaxis of typhoid fever there is a full description of inoculation, with useful observations. In reading the chapter on typhoid fever one is impressed by the fact that typhoid among soldiers at the present day is a very different disease from typhoid among the uninoculated, as described in textbooks. The paratyphoids receive a chapter to themselves, but treatment is not given to any extent, as the reader is referred to that of typhoid.

One notes two or three references to this journal, and to the work of our Director-General. Indeed, in connexion with the typhoid group, it might be expected that more would appear in the bibliography. Dr. Rolleston's book will be of considerable value to practitioners and students, as it is both practical and sound. M. B. H. R.

The C.A.M.C. With the Canadian Corps during the Last Hundred Days of the Great War. By Colonel A. E. Snell, C.M.G., D.S.O., etc. Ottawa: F. A. Acland. 1924. (Pp. ix and 292 with four plans in text and seven maps in pocket of cover.)

In a preface to Sir Andrew Macphail's official medical history of the Canadian Forces during the War, the Director of the Historical Section of the General Staff in Ottawa refers to the publication, by properly accredited regimental historians, of the exploits of their units overseas. These more intimate records are not Government publications but they contribute to the whole by covering limited portions of ground more closely than the official publications. The advice and assistance of the Historical Section are given in their preparation. Colonel Snell's record of the Canadian Army Medical Corps during the last hundred days of the War is of this nature and, although it is not from this point of view an official publication. it has been published by authority of the Canadian Minister of National Defence. It is a valuable addition to the medical history of the War as a whole, and will repay close study by those who interest themselves, as all officers of the R.A.M.C. should, in the strategical and tactical employment of the medical services within a Corps area of operations. In the

first chapter a short description is given of the medical establishments of the Canadian Corps. It is followed by eleven other chapters dealing with the different phases of the advance to victory, ending with the armistice and the advance to the Rhine. A Padre contributes under the heading of *L'Envoi* two or three pages in praise of the Canadian Army Medical Corps at the close of the book. As a spectator of its work he pays a tribute to those who, he says, "after the manner of the British Navy, maintain an excessive silence on their own exploits and heroisms." There are four appendices. The first reproduces the orders issued by the A.D.M.S. of the 3rd Canadian Division on August 5 and 7, 1918 (one being a series of useful notes on the medical situation in the case of a rapid advance) and the operation orders issued on the latter date by the officer commanding No. 3 Canadian Field Ambulance. Appendix II is a roll of medical and dental officers who served with the Canadian Corps during the last hundred days; Appendix III, the War establishment of a Canadian Field Ambulance, and Appendix IV, the order of battle of the Canadian Corps. Instructions how to read a squared map are added. All these are of much value to the student of medical history. There is a brief Introduction by Major-General Fotheringham, which exactly describes the nature and value of the volume, "as a source from which tactical and administrative problems can be studied by coming generations of medical officers." Most of the administrative points to which Colonel Snell refers have been considered in the British Official Medical History of the War, and it is unnecessary to note them in detail in this review. The dual control of the casualty clearing stations of the First Army by its D.M.S. and Corps D.D.M.S. has his approval, but he rather gives himself away on this point by saying that "the more successful the operation the more did the forward area absorb the attention of the D.D.M.S., and the further the advance the less opportunity he had to visit the casualty clearing stations. It was then that the D.M.S. of the Army resumed closer control over these units." This is exactly the point which makes it essential that a casualty clearing station should remain an Army and not a Corps unit, and as for dual control, it is fatal to all forms of administration. Points which are well illustrated in the book are the value of light railways, the necessity of retaining horsed ambulance wagons, the difficulty of moving motor ambulance cars up along a congested road during an advance, and the excellence of prisoners of war as stretcher-bearers. The German prisoner of war is described as "possibly the best stretcher-bearer in the world. By his dogged perseverance he will keep going without a whimper for many miles." Colonel Snell also recognizes a deliberate effort on the part of the enemy to refrain from firing on medical units. This, of course, is not the impression caused by the bombing of medical units behind the Ypres salient in 1917, but it is interesting to note Colonel Snell's experience during the advance to victory, and indeed, at an earlier period, he quotes an experience of the 2nd and 3rd Canadian divisions in front of Ficheux after the Germans had broken through in the spring of 1918. The enemy held a commanding position overlooking the Canadian lines, but allowed the motor ambulance cars to come up each evening while it was still daylight to within a thousand yards of the front line and collect the wounded from the regimental aid posts. "Never on one occasion were these cars sniped or shelled." He alludes feelingly to the difficulties that arose after the field

ambulance motor repair unit was withdrawn from the divisional medical services. We can all sympathize with him in this.

The general arrangement of the volume is good but there are two conspicuous defects. There is no index and the maps at the end of the volume are difficult to read; one is practically illegible. They have been reproduced apparently by photography from the general staff maps, and, in the case of the illegible one greatly reduced. The value of the book would have been much enhanced by the introduction of simple sketch maps in the text; but officers of the R.A.M.C. must be grateful to their Canadian confrère for presenting them with this interesting and valuable study of the medical services of a division and a corps during a war of movement.

Correspondence.

THE RECORDING OF CASES TREATED IN BARRACKS.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—In the November number of the *Journal* I noted a suggestion for the adoption of an additional Army Form in connection with the treatment of patients in barracks, "A medical out-patient's index card," and in which "Every attendance at the medical inspection room would be entered up, with the eventual disposal of the case."

I believe this would involve an immense amount of avoidable clerical work in addition to the inconvenience of the manipulation of another document.

Might not the purpose of the suggested "index card" be better served by a space being reserved, or additional space provided, in the medical history sheet in which to record all cases of interest treated at the medical inspection room? Trivial lesions, such as minor injuries, would not be noted.

This record would be of the utmost value, not only in keeping note of chronic attendants at the medical inspection room, but in providing a full medical history of cases of early disease, e.g., D.A.H. or T.B., whose lesion may be more or less apparent while at work but whose symptoms are rapidly obscured or disappear with rest, hospital routine and treatment.

The medical history obtained would be of value in treatment and diagnosis in hospital, and would facilitate the decision of medical boards.

The two records, barrack and hospital, being on the medical history sheet would ensure the complete history being noted on all occasions, and would obviate the redundancy of similar reports appearing on two forms, e.g., specialists' reports, admissions to hospitals, etc.

I am, etc.,

B.T.E., WM. STEWART,

December 6, 1925. *Major, R.A.M. Corps.*

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Any demand for *reprints, additional to the above*, or for excerpts must be forwarded at the time of submission of the article for publication.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are inserted free of charge to subscribers. All these communications should be written upon one side of the paper only; they should by preference be typewritten; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS." War Office, Whitehall, S.W.1.

The Committee has sanctioned the publication of correspondence on matters of interest to the Corps, and of articles of a non-scientific character under a nom-de-plume. These communications must, however, be approved by the Editor before publication.

MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription for the Journal and Corps News Supplement is £1 (which includes postage), and should commence either on 1st July or 1st January; but if a subscriber wishes to commence at any other month he may do so by paying for the odd months between 1st July and 1st January at the rate of 1s. 8d. (one shilling and eightpence) per copy. (All subscriptions are payable in advance.)

Single copies can be obtained at the rate of 2s. per copy.

The Corps News Supplement is also issued separately from the Journal, and can be subscribed for at the rate of 4s. (four shillings) per annum, including postage. All subscriptions are payable in advance.

Subscriptions for the Corps News Supplement separate from the Journal cannot be accepted from Officers on the Active List unless they are also subscribing to the Journal.

Single copies can be obtained at the rate of 6d. per copy, excluding postage.

Cheques or Postal Orders for Subscriptions, etc., should be made payable to the "Hon. Manager, Journal R.A.M.C." and crossed "Holt & Co."

All communications should be addressed to THE HON. MANAGER, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," WAR OFFICE, WHITEHALL, S.W. 1.

All Applications for Advertisements to be made to—
G. STREET & CO., LTD., 8, SERLE STREET, LONDON, W.C. 2.

No. 3. March, 1926. Vol. XLVI.

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

LIEUTENANT-COLONEL A. E. HAMERTON, C.M.G., D.S.O., R.A.M.C.

ISSUED MONTHLY

Printed and Published by
JOHN BALE, SONS & DANIELSSON, LTD.
83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

Price Two Shillings net.

BY APPOINTMENT

Regimental Badge Jewellery.

8-ct. Gold and Enamel Brooch with Gold Snake £4 7 6

18-ct. Gold and Enamel Brooch with Rose Diamond Snake ... £7 10 0

THE Badge illustrated is one of the many fine pieces of Jewellery produced by the Military Department of the Goldsmiths and Silversmiths Company. Whilst taking pride in the beautiful specimens fashioned by their expert craftsmen, the Company does not lose sight of the fact that plain and simple badges of Gold and Enamel are often preferred. Of these many pieces exist, bearing the same care and attention to detail and workmanship as is bestowed on all the Company's productions.

Selections sent for approval to any part of the United Kingdom.

The Goldsmiths & Silversmiths Company Ltd.

No Branches. Only ONE Address.

112, Regent Street, London, W. 1.

For INDIGESTION *and* DYSPEPSIA

Lactopeptine

LACTOPEPTINE IS A NON-SECRET REMEDY WITH ITS FORMULA ON THE LABEL OF EACH BOTTLE

ELIXIR LACTOPEPTINE

A very palatable form of administering Lactopeptine combining the digestive properties of the latter with the stimulating effect of a pleasant aromatic tonic. Specially recommended.

THE digestive ferments (pepsin, pancreatine, diastase) used in the manufacture of Lactopeptine are of the highest grade. Although this preparation has been prescribed by the Medical Profession for over 40 years, its ingredients have been constantly improved and kept up to date by the most advanced pharmaceutical practice.

When prescribing specify in all cases Lactopeptine (Richards). Dispensed in 1 oz. (4/6) and ½ oz. (2/9) bottles, in powder or tablet form. To prevent substitution, Medical men are requested to prescribe Lactopeptine in original bottles.

Samples (powder, tablet and Elixir form) free of charge on receipt of professional card.

JOHN MORGAN RICHARDS & SONS, LTD.,
46 HOLBORN VIADUCT, LONDON, E.C. 1.

VOL. XLVI. MARCH, 1926. No. 3

Journal

of the

Royal Army Medical Corps.

Original Communications.

NOTES ON A RECENT EXAMINATION OF MAJORS, R.A.M.C., FOR PROMOTION TO LIEUTENANT-COLONEL (PART II).

By MAJOR-GENERAL H. A. HINGE, C.B., C.M.G., D.S.O., K.H.S.

THE following brief notes are written with the view of bringing out a few prominent points which have arisen in the course of a Medical Staff Tour at a recent examination for Majors, R.A.M.C., in the hope that they may be of assistance to future candidates for promotion.

(1) *Map Reading.*—During recent years, many excellent schemes set for the training of Majors, R.A.M.C., have been published in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS. In these schemes, maps of the country dealt with have not been included, which renders the task of following the situations given in the text a very difficult matter.

As a matter of fact, map reading in the field was found to be the weakest point among candidates. Every officer should be able to set a map correctly, understand the grid system, and identify a natural feature marked on the map with the same object in the field. A judgment of visibility as shown by contours is required. These are not difficult problems but very few candidates possessed the necessary standard expected. A study of the chapters dealing with these points in the "Manual of Map Reading and Field Sketching" is strongly recommended to all candidates. Incidentally, questions on March Timings may also be asked.

(2) *Orders.*—The drafting of R.A.M.C. Operation Orders as A.D.M.S. of a Division was found generally to be another decidedly weak point. Orders suffered from diffuseness, frequently contained unnecessary matter, were lacking in precision and were often faulty in form and distribution. A point to keep in mind is that "Divisional" Orders are not issued to field ambulances. An excerpt, therefore, from these should be given, but

should contain only so much matter as it is necessary for the O.C. field ambulance to know.

It is considered unwise to interfere with the discretion of field ambulance commanders more than is necessary, and such details as the siting of A.D.S.'s when first established, and bearer relay posts, are best left to them. Section 87, Instructions F.S. Regulations, Volume I, should be read in this connexion. Section 189, F.S. Regulations, Part II, subpara. 4, also brings out this point clearly.

No hard and fast rule can be laid down as to how far it is advisable to pool the resources of field ambulances in battle, or to leave them to deal with the Brigades to which they may have been attached. Each situation must be judged on its merits.

As a rule, when the divisional front is a contracted one, or where there is only one possible line of evacuation within the divisional area, the policy of placing one officer in charge of the medical arrangements in the forward zone and reinforcing his own unit by detachments from other field ambulances is sound. On the other hand, where the front is extensive, and where there are several possible lines of evacuation, a division of the responsibility for clearing a front is necessary. A point which should not be lost sight of is, that the splitting up of units always makes a complication. Further, where a field ambulance commander has been accustomed to work with a particular Brigade it is considered bad policy to separate them unnecessarily. If a fresh Brigade is thrown into battle it is not a *sine qua non* for the reserve field ambulance to function for it. It is better to reinforce if necessary the Field Ambulance already in charge of the evacuation of wounded, whose Commander knows the lie of the land, with detachments from the reserve field ambulance.

As regards the form in which orders should be written, a study of Field Service Regulations, Volume II, Chapter XIV, is necessary.

(3) *Appreciation.*—An appreciation is usually the first task set in any examination. It is founded on a narrative given by the General Staff. It is unnecessary to repeat in the appreciation all the information given in the narrative. It should be taken as known, or the merest summary given.

A point frequently overlooked in the preparation of an appreciation is the priority of arrival of medical personnel and units in the sphere of operations. See Field Service Regulations, Volume II, Section 21 (3) (6). The arrangements for the reception and treatment of sick, etc., in the concentration area, with their disposal, is another important matter. Volume II, General History Medical Services, Chapter VIII, on the "Period of Concentration" in the "Official History of the War," deals with these. This chapter should be studied in conjunction with Chapter IV on Strategical Concentration, Field Service Regulations, Volume II, 1924.

With regard to the medical arrangements in the Concentration Area, field ambulances normally would be billeted in Brigade Areas and the

A.D.M.S. of the Division would usually direct one suitably situated field ambulance to open, so far as necessary, for the collection and treatment of divisional sick. Regimental medical officers would see their sick, and those requiring admission would be collected by the motor ambulances of the Field Ambulance billeted in the Brigade Area and taken to the Field Ambulance functioning as above. The responsibility for the evacuation of cases from the Divisional Area rests on the D.M.S. Force.

A practical point which might be brought out here, although it does not come within the sphere of examination work, is the necessity for prohibiting regimental medical officers from detaining sick in their regimental aid posts on these occasions. If sick are thus detained, and the Division, as is very probable, is directed to move at short notice, the Field Ambulances will receive urgent demands for ambulance transport at the last moment from all directions and thus the move arrangements of these units will be disorganized.

Gas.—The consideration of "Gas" should not be omitted in any appreciation.

(4) *Selection of Sites for Casualty Clearing Stations.*—This is a question frequently asked in examinations. A point which should invariably be taken into consideration is whether the casualty clearing station is likely to remain undisturbed for some time or may be required to move at short notice. In the former case, an unoccupied site, suitable for tents or huts, may be selected; in the latter, existing buildings should be utilized so that the move may be made with the least possible dislocation.

(5) *The Evacuation of Wounded from a Battlefield from an Administrative Point of View.*—This is a problem requiring careful consideration, particularly when the evacuation has to be calculated on a time basis.

For practical purposes, the evacuation should be classified in two zones:—

First Zone.—From regimental aid posts to the advanced dressing stations or walking wounded collecting stations.

Second Zone.—From advanced dressing station or walking wounded collecting station to the main dressing station or casualty clearing station.

It may be remarked here that a very large number of casualties of a serious nature will arrive at the advanced dressing station or walking wounded collecting station on foot, and a large proportion of these become stretcher cases in the second zone. In view of this, the provision of sufficient ambulance transport at the walking wounded collecting station should not be overlooked. On the other hand a percentage of walking wounded arrive at the advanced dressing stations, but these can be evacuated by utilizing the sitting accommodation of the motor ambulances.

With this digression, to return to the two zones, "sitting" cases may be excluded from the first zone just as "walking" cases may be excluded from the second zone. Thus we have in each zone two categories only,

in the first zone "lying" and "walking" cases, and in the second zone "lying" and "sitting" cases.

In order to assimilate the various categories of wounded as laid down by various authorities, viz., "unable to move," "lying," "sitting," and "walking," the first two and last two of these may be combined, and taking the figures given in paragraph 265, Royal Army Medical Corps Training, 1911, as applying to the *first zone*, under lying we get 5 per cent unable to move + 15 per cent lying = 20 *per cent "lying"*; and under walking, 20 per cent able to walk + 60 per cent sitting = 80 *per cent "walking."* This means that in the *first zone* the proportion of "lying" to "walking" cases is as one to four.

It may be taken that 20 per cent of the group classified as "walking" in the first zone will become "lying" cases in the second zone and the figures, roughly, for this latter zone thus become, "lying" 40 per cent, "sitting" 60 per cent, the walking cases disappearing. These figures for the second zone may be said to be in agreement with the statement of proportions of wounded given on page 25 of the "Official History of the War, General History," Volume II. In discussing these figures "gas" casualties must not be overlooked, and the proportion of these to be allotted to the various categories mentioned depends of course on the gas used. All that can be said here is that "persistent gas" cases are usually walking, and "non-persistent" lying cases, but no hard and fast rule can be laid down. For practical purposes it is considered that the categories of gas cases may be taken at the same figures as those given above for "wounded."

Considerations which must be taken into account when working out the time table for evacuation are: the necessity of food and rest for bearers, horses and ambulance personnel; the effect of darkness in slowing operations and, of course, the length of the various carrying stages.

(6) *Medical Personnel left with Wounded* (*under Article* 1 *of Geneva Convention,* 1906).—The following points arose in a question on this subject :—

The term "medical personnel," as stated in Article 1, does not necessarily include medical officers, and in the case of small collections of wounded they are certainly not necessary. The number of personnel should, in any case, be restricted to the bare minimum called for by the dictates of humanity. Also, before medical personnel are allowed to fall into the hands of the enemy, authority for this should, if possible, be obtained from the responsible commander.

DENTAL SEPSIS, ITS NATURE AND SYSTEMIC EFFECTS.

By Captain S. H. WOODS.
The Army Dental Corps.

Introduction.

One of the greatest advances in medicine of the present century is the recognition of the mouth as a focus of infection.

To William Hunter, of London, belongs the credit of having aroused the medical profession to the importance of dental sepsis. In 1900, he said, "It is not the absence of teeth but the presence of sepsis; it is not dental defects *per se* but chronic septic poisoning; it is not defective mastication but effective sepsis; it is not accumulation of fermenting food debris between teeth, but the presence of virulent streptococcal sepsis in open wounds in the gums and sockets, teeth and bone, that underlie the ill-health so frequently associated with bad mouths."

Mitchell Bruce, in his presidential address to the British Medical Association in 1910, said of oral sepsis: "Its effects are so widespread, so multiple and frequently so grave as to make us ashamed of our previous blindness to a common source of blood infection staring us in the face all these years. And how many years, be it added! The last discovered fossil skull found in Rhodesia, at the Broken Hill Mine, showed widespread dental caries with evidence of extensive alveolar abscesses, and associated was a condition of the upper end of the tibia suggesting chronic arthritis. This skull is considered as belonging to the Pleistocene Period."

In the early days of this movement somewhat extravagant claims were made, and there was a general tendency to condemn teeth as the cause of all sorts of systemic conditions, on insufficient evidence and, it must be confessed, on insufficient knowledge.

On the one hand, the extremist physician advocated wholesale extraction of teeth in order to eradicate at the outset any possibility of dental sepsis, while on the other hand the extremist dentist endeavoured to save every possible tooth for his patient, however diseased it was. But soon the moderates of each side tended to co-operate in the interests of the patient, and gradually evidence was gathered tending to show the undoubted relationship of dental to systemic disease.

The recent great increase in the knowledge of dental pathology brought about by the development of dental radiography, coupled with intensive research into the histology of the tissues, broadened enormously the point of view of the dental profession. At the same time, the tendency of medicine along the line of preventive treatment stimulated increased interest in the elimination of those hitherto unsuspected areas of periapical bone infection which the X-rays revealed.

This brought about a closer co-operation and a more rational attack on the problem, with encouraging results. But the whole problem is still far from solution and presents peculiar difficulties, not the least of which is an imperfect knowledge by the general medical practitioner of the nature of dental sepsis.

When it is considered that every adult mouth not subject to frequent examination and treatment presents some degree of obvious sepsis—a point Medical Inspectors of Recruits will appreciate—and also that a considerable degree of quite unsuspected latent sepsis may exist in a mouth periodically treated, the importance of the problem cannot be exaggerated. The mouth is not to be regarded as a sort of water-tight compartment outside the body from which no leakage can take place into the system, and of importance only to the dental surgeon. It does most certainly concern the modern physician who endeavours to investigate and remove every possible focus of infection which may be associated with the condition under treatment.

It is essential for him to have some idea of the nature and possible extent of those septic and infective conditions of the dental tissues embraced in the comprehensive term "dental sepsis."

In the words of Sir William Willcox,[1] "There is no problem in medicine for which careful scientific investigation and well-balanced judgment are more required. To solve this problem, it is essential that there should be the closest co-operation between dental surgeon, physician, radiologist, bacteriologist and all associated with the investigation."

Such co-operation in the Army has only become possible since the formation of The Army Dental Corps in 1921 and the posting of dental officers to the large military hospitals. It has been my good fortune during the last three years to be stationed at Queen Alexandra Military Hospital, Millbank, London, where an ideal co-operation has existed from the outset, resulting in an increasing number of hospital patients being sent by the various departments and wards for the elimination of dental sepsis.

The experience gained in this connexion has prompted me to write this paper, and though the cases recorded are few and the investigation very limited, it is hoped this article, however incomplete, may be of some interest.

It is written primarily for medical officers and purely from the standpoint of Army practice, and attempts only to serve as a general introduction to the problem, concluding with a consideration of the question with particular reference to the Army.

It attempts to answer three questions :—

(1) What is the nature of "dental sepsis"?

(2) What are the factors governing its systemic effects?

(3) What are the systemic lesions produced?

Each question embraces a vast field, and it is only possible to touch on essential points in each.

---

[1] Dental Board of the United Kingdom Lectures, "Systemic Effects," 1923.

The paper is arranged as follows :—

Section I.

Subdivision	(*a*)	Anatomy	To answer Question (1).
,,	(*b*)	Pathology	
,,	(*c*)	Bacteriology	

Section II.

Subdivision	(*a*)	Factors governing effects	Questions (2) and (3) treated together.
,,	(*b*)	The systemic effects	

SECTION I.—SUBDIVISION (A)

Anatomy and Histology.

While the normal appearances of the teeth and gums are well known, it is essential to draw attention to some important points in dental anatomy and histology.

Dental tissues are divided into :—

(*A*) *Hard* Structures.—Tooth, alveolar bone, bone of jaw.

(*B*) *Soft* Structures.—Gum, periodontal membrane, pulp.

(*A*) *Hard Structures.*

A *tooth* is divided into :—

Crown, that part normally above gum and composed chiefly of dentine covered by enamel.

Root or roots, normally hidden in bony socket and composed of dentine covered by cementum.

Neck, the junction of crown and root, normally covered by the gum margin.

The only part of the tooth which we need consider in some detail is *cementum*, which is the smooth, yellowish-white and very hard substance covering the root.

Cementum is similar to bone in structure, is arranged in concentric laminæ around the dentine and contains cementoblasts, contained in lacunæ, with long processes, lodged in canaliculæ, running towards the exterior. These cells intercommunicate and cementum is therefore permeated by a living protoplasmic network. It contains no blood-vessels.

Alveolar bone is the socket or alveolus in which the tooth is embedded and consists of cancellous bone lined by a thin layer of dense compact bone. It is a special structure dependent upon the presence of teeth, and when a tooth is extracted it is this bone which shrinks and disappears by a process of absorption.

The spongy nature of alveolus is beautifully indicated by the odontogram, in which it appears as a fine interlacing network, and the compact bone of the lining as a continuous thin, white line round the root.

The force exerted during extraction is inclined to give a totally false idea of the density of alveolus and its open texture must be borne in mind. The strength of alveolus depends purely on the arrangement of its lamellæ,

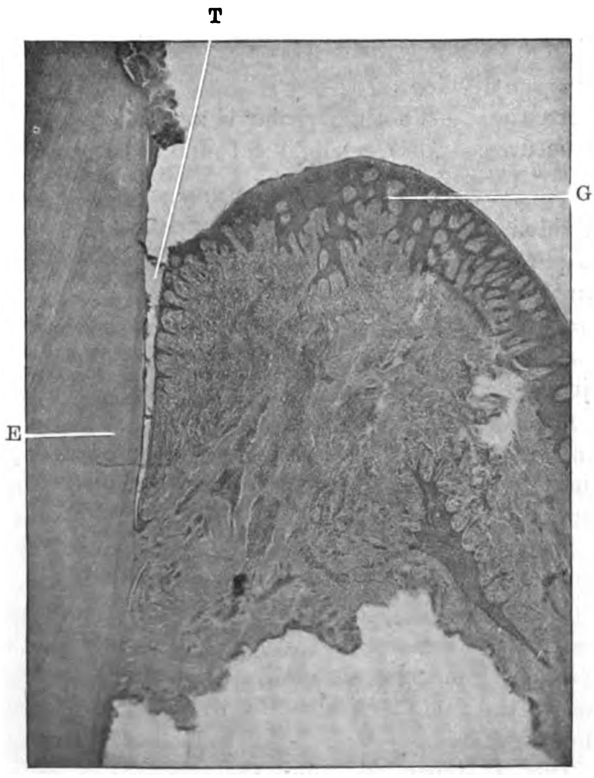
which are placed at angles to one another. Each lamella has a covering of endosteum, the cells of which have the power to form new bone or destroy that already present, depending on the stimulus reaching them.

Maxillary alveolus is much more spongy than mandibular, particularly in the molar region, hence it follows that infection spreads more rapidly and extensively in the former.

Bone of jaw is similar to alveolus, with which it is directly continuous. Here, also, the main body of the maxilla is more spongy than that of the mandible.

(*B*) *Soft Structures.*

Gum covers the alveolus and is continuous with the mucous membrane of the mouth, from which it differs chiefly by its greater density. It



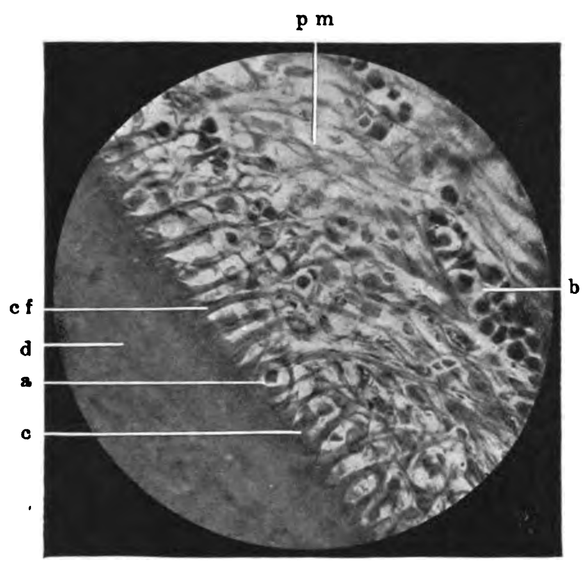
(*By permission of the Dental Board of the United Kingdom.*)

FIG. 1.—Low-power photomicrograph from the cervical region of an unerupted tooth, showing—E, enamel; T, gingival trough; G, many layers of epithelium of gum, diminishing in thickness towards tooth and fading off into a thin squamous layer lining the trough.

consists of a dense submucous layer, closely attached to the underlying bone by tendinous fasciculi and a mucous membrane of many layers of squamous epithelium. It is pale pink, firm, free of tenderness and is designed to withstand very considerable pressure.

The triangular spaces between teeth, just under their points of contact, are entirely filled in by gum known as the "interdental papillæ."

The part of the gum which embraces the neck is known as the "cervical gum" or "gum margin," and plays a most important part in the pathology of dental sepsis. It is not attached flush to the tooth but in such a manner as to leave a slight V-shaped depression round it, about one-eighth inch in depth, known as the "gingival trough." The floor and outer wall of this depression are covered by epithelium which forms a smooth lining and is reflected upon the tooth, thus effectively sealing the trough and shutting off the periodontal membrane from the fluids of the mouth.



(By permission of the Dental Board of the United Kingdom.)

FIG. 2.—High-power photomicrograph, showing—a, cement cell; b, epithelial cell-nests; c, cementum; d, dentine; c f, cemental fibres, starting near b, and running in between a to enter c; p m, periodontal membrane.

This epithelial lining decreases in thickness from gum margin towards the floor and fades off into a thin squamous layer at the apex of the V, thus presenting an area of lesser resistance at this site (fig. 1).

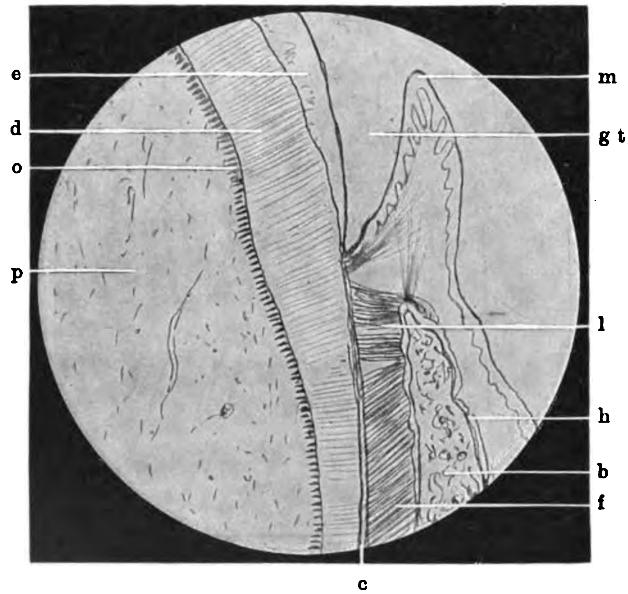
Normally the gum margin is very closely applied to tooth and the gingival trough must be regarded as a potential space only. This will be readily appreciated if one tries to pass the point of a fine probe between normal tooth and gum. Allowing 1 inch as the average circumference of the thirty-two teeth in the mouth and $\frac{1}{8}$ inch as the average depth of the troughs, it will be seen that their area in health is 4 square inches.

The periodontal membrane is a thin single membrane which invariably intervenes between tooth and alveolus and is directly continuous with the

gum margin immediately under the gingival trough. *It must be clearly emphasized here that the main source of infection from the mouth is the periodontal membrane, and it is essential to study it in some detail, as the whole problem of dental sepsis is centred in this tissue.*

Particular attention must be focused on (*a*) the nature and arrangement of its fibres; (*b*) its lymphatic system; (*c*) its cells.

(*a*) *Fibres.* The periodontal membrane is chiefly composed of bundles of white fibrous connective tissue, entirely non-elastic, which run transversely through it and pass right into the substance of bone and cementum, the portions so contained in these tissues being known as "bone" and "cement" fibres respectively (fig. 2, c f).



(*By permission of the Dental Board of the United Kingdom*).

FIG. 3.—Diagram showing—e, enamel; d, dentine; o, odontoblast cells lining periphery of pulp, p; c, cementum; f, oblique fibres; b, spongy bone of socket, with its compact lining, h, ; l, circular ligament; g t, gingival trough; m, crest of gum margin.

The fibres run in an oblique upward direction from tooth to bone except round the neck, where they assume a very definite and regular arrangement. Here they are densely packed together and run horizontally across from tooth to bone, and some arch over the alveolar crest to unite with its periosteum. This dense horizontal band of fibres which embraces the neck of each tooth is known as the "circular ligament," and is immediately under the gingival trough (fig. 3).

The oblique fibres suspend the tooth in its socket, allowing of a very limited movement and preventing undue pressure on the apical vessels.

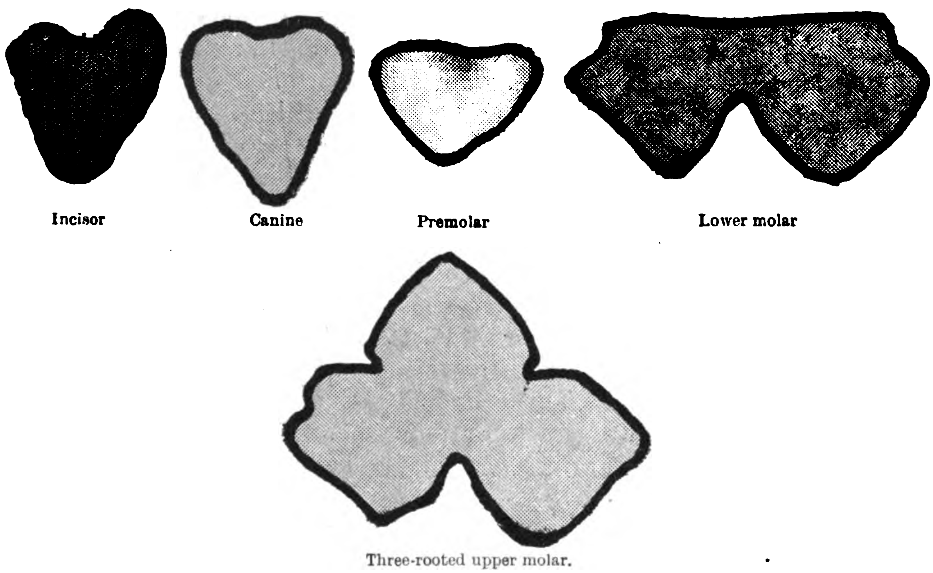
The circular ligament is protective to the underlying part of the periodontal membrane and also acts as a strong ligament.

The bone and cement fibres penetrate the hard tissues in more or less parallel lines and are lodged in distinct channels in them.

The periodontal membrane is more strongly attached to tooth than alveolus and is always removed with it on extraction.

It is important to gain some idea of the area of the periodontal membrane when stripped off the tooth. Fig. 4 indicates the exact surface area of the different teeth, a point which will be considered in the section on pathology.

The periodontal membrane is thicker just around the apex than elsewhere,



(*By courtesy of the "British Medical Journal."*)

FIG. 4.—[1] Exact surface area of average tooth from the gum margins to the apices.

this thickening or pad acting as a shock-absorber. In the radiogram the membrane is indicated as a very thin continuous black line between cementum and bone, and shows a slight increase in width at the apex, where the tissue is thickest.

(*b*) *The Lymphatic System.*—Up to 1907 no lymphatics in the periodontal membrane had been demonstrated. It was presumed there must be a lymphatic system similar to that found elsewhere in the body. In 1907 it was shown that a wreath of lymphatics surrounds the neck of each tooth, just above the circular ligament.

In 1918, by means of the Prussian blue injection method, the complete lymph system in gum and membrane was demonstrated for the first time, thus filling a large gap in our knowledge of the functions of the

[1] From "Pyorrhœa Alveolaris." D. A. Crow.

periodontal membrane. It was shown that the wreath-like system just described is continued through the circular ligament and passes down the membrane to the region of the apex, where it joins the lymphatics from the pulp and then anastomoses with the lymphatic network in the medullary spaces of the bone.

(*c*) *The Cells.*—There are three kinds, each playing a different part in the pathology, and may be classified as follows :—

(1) *Cement cells* (fig. 2, *a*), in contact with cementum.

(2) *Bone cells*, similar to osteoblasts, in contact with alveolus.

(3) *Epithelial cell-nests*, scattered here and there between 1 and 2, chiefly round the apical region.

These are regarded as remains of an embryonic membrane present in the early stages of calcification (fig. 2, *b*). The periodontal membrane is directly continuous with the pulp at the apical foramen and has a rich blood supply, the vessels passing down its centre.

The pulp is the soft vascular tissue which is enclosed by dentine, and corresponds more or less to the shape of the tooth. It is directly continuous with the periodontal membrane at the apical foramen, through which enter its vessels and nerves.

Its periphery is lined by special cells, each of which sends off long processes which penetrate the entire thickness of dentine and anastomose with cells at the junction of dentine and cementum. We have already noticed the anastomotic network in the latter. This is continued through the periodontal membrane, via the cement cells, then by ordinary connective-tissue cells to the bone cells lining the alveolus. Thus there is direct protoplasmic continuity from pulp through dentine, cementum, periodontal membrane and alveolus, a point to be borne in mind.

SECTION I.—SUBDIVISION (B).

PATHOLOGY.

Those acute conditions which, by their marked clinical signs and symptoms, demand and receive early attention play no part here. I refer to acute alveolar abscess, acute ulcerative gingivitis, and any of the usual conditions for which the soldier reports "sick" and receives attention.

We are concerned only with those periodontal infections which give rise—at any rate in their earlier stages—to no marked local sign or symptom, and which may be present for long periods without causing pain.

It is only possible, within the limits of this paper, to treat this section in a general manner, and to indicate the extent of the tissue reaction following infection of the periodontal membrane.

This infection takes place in two ways :—

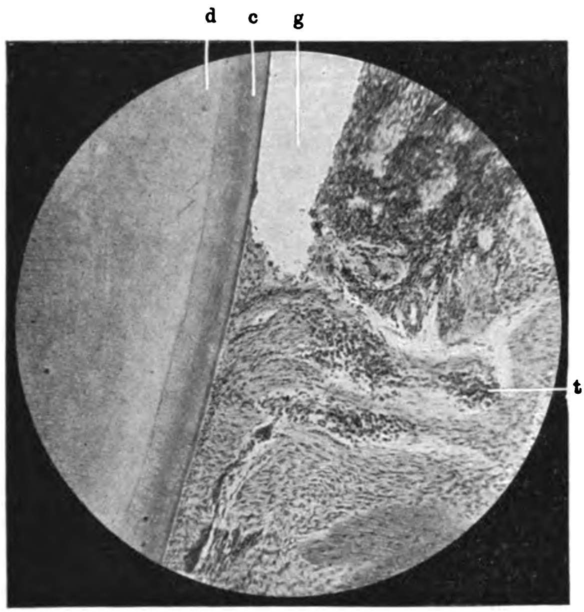
(1) *Externally*, via the gingival trough.

(2) *Internally*, via the apical foramen.

(1) *The External Infection of the Periodontal Membrane.*

We have noticed that the epithelium lining the gingival trough effectively seals off the periodontal membrane from the oral fluids. In addition, it is believed on strong evidence that the trough is normally sterile, leucocytes being found in it in abundance, which act as phagocytes, taking up and ingesting any organisms finding their way into this space.

Any injury to the gum margin not healing by resolution leads to a breach in its epithelium, followed by infection by the ever-present bacteria which swarm on its surface, resulting in a destructive inflammation at the site of injury.



(By permission of the Dental Board of the United Kingdom.)

FIG. 5.—Destruction of the epithelial lining of the gingival trough (g); t, granulation tissue; c, cement; d, dentine. Photographed from a preparation by Mr. Malleson.

The soft wall of the gingival trough is directly involved, becomes hyperæmic, swells away from the tooth and thus converts the potential space into an actual one. Its smooth epithelial lining is broken, and at once the underlying periodontal membrane is open to infection by the organisms which are swept into the breach by the saliva (fig. 5).

Whatever the exciting cause may be, these early changes are constant, and of the numerous causes of the initial injury it is only necessary to consider three :—

(*a*) Impaction of food debris.
(*b*) Deposits of salivary calculus (tartar).
(*c*) Overhanging edges of fillings and crowns.

(*a*) *Food Debris.*—This occurs most frequently in the premolar and molar region, where the large contact area is more likely to hold strands of meat, fish and fruit than the much smaller and self-cleansing points of contact of the incisors.

A stagnation area is set up immediately around the site of injury, followed by a low-grade inflammation and slow destruction of the periodontal membrane in a cup-shaped manner, forming pockets. The crest of alveolus is involved and absorbed by the osteoclastic action of its bone cells, and the condition results in a destruction of the investing tissues of the tooth around the site of injury.

When both sides of a premolar or molar are involved, the tooth becomes progressively loose after a time, the infection encroaches on the apical portion of the periodontal membrane, the pulp is involved and changes are started in it which lead to its slow death.

Pus is generally absent or only present in small quantity, and, apart from the discomfort of food impaction, there may be no pain and the crowns may be free of caries.

From the onset of the condition, the toxins are absorbed directly via the lymphatics, and as several teeth are often involved, the toxin-forming area may be extensive (fig. 4). On extraction the periodontal membrane will have an offensive odour, and if it be scraped off the root and the latter sterilized externally by passing it through a flame, the tooth substance and pulp will be found equally offensive when cracked open.

(*b*) *Deposits of Calculus.*—Tartar is of two varieties, superficial and subgingival. Superficial tartar is deposited at the gum margin and is confined chiefly to the lingual surface of the lower incisors and the buccal surface of the upper molars. If removed at frequent intervals it causes no harm, but if allowed to increase over a long period it causes extensive damage to the gingival troughs and leads to stagnation areas with subsequent infection of the periodontal membrane, and sequelæ similar to those just described.

Subgingival tartar is always pathological, is not obvious and is found round any tooth subject to a marginal gingivitis. It is hard and dark, sometimes forming a ring round the tooth, and always causes a local injury to the gingival trough in contact with it.

It is very frequently found on the lingual surfaces of lower molars and the upper incisors, areas which are often untouched by the toothbrush and in which considerable destruction of investing tissues may result. If not removed, destruction of periodontal membrane progresses and the condition resembles that of impaction of food debris with similar results.

It has been noted that the potential area of the gingival troughs is four square inches, and while a deposit of tartar involving all this area is necessarily rare, that involving one square inch or more is quite common, and as it persists for long periods the amount of toxic absorption via the lymphatics may be considerable.

(c) *Overhanging Edges of Fillings and Crowns.*—We have just seen the results of local injury to the gingival troughs and can readily appreciate the sequelæ of any filling leaving an edge below the gum margin.

The neck is the most constricted part of the crown and great care is needed to restore the exact contour in this region. While the edge of a filling or inlay is limited to a portion of the neck, that of a crown at once involves the whole circumference of the gingival trough. The crown plays such an important part in dental sepsis that it must be considered in detail.

Crowns are of two kinds: (1) *Collar*; (2) *Flush.*

The collar crown is essentially a metal cap, which embraces the tooth at the neck and is designed to render serviceable a tooth which is too broken

y z

x

(*By permission of the Dental Board of the United Kingdom.*)

FIG. 6.—x, A bicuspid showing an ill-fitting gold inlay in the cervical area; y, a molar showing the overlap of an ill-fitting gold cap; z, a normal molar for comparison of cleansibility.

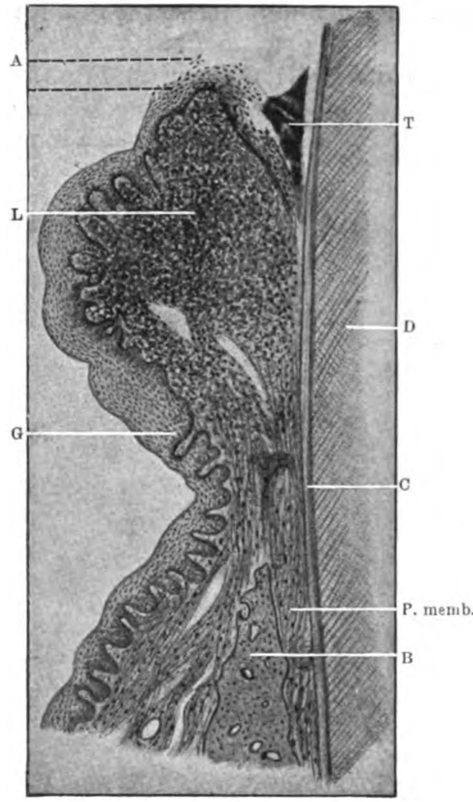
down by caries or injury for conservation by the usual means. Theoretically, it should be so shaped and the root so prepared in the form of a truncated cone that the collar should pass just under the gum margin without causing direct pressure on the floor of the gingival trough. However carefully this fitting is done, it is obvious the edge of metal is a foreign body in the trough and that a stagnation area will result under its edge followed by the usual pathological changes in the investing tissues.

But it must be confessed that the great majority of such crowns I have seen in the mouths of officers during the last four years show little, if anything, of this careful adjustment of collar or preparation of root and, quite apart from the apical condition of the teeth, the cervical tissues in every case showed marked sepsis.

The overhanging edges of collar crowns are clearly shown in radiograms, and I have a large number exhibiting every degree of approximation of

metal and tooth, some indeed showing the extreme toleration of the tissues to ill-treatment (fig. 6).

The flush crown is a porcelain tooth which is ground to fit flush with the previously prepared root, and here it is possible to obtain a very close adjustment with hardly a perceptible edge. It is kept in place by a metal post which is cemented into the root canal.

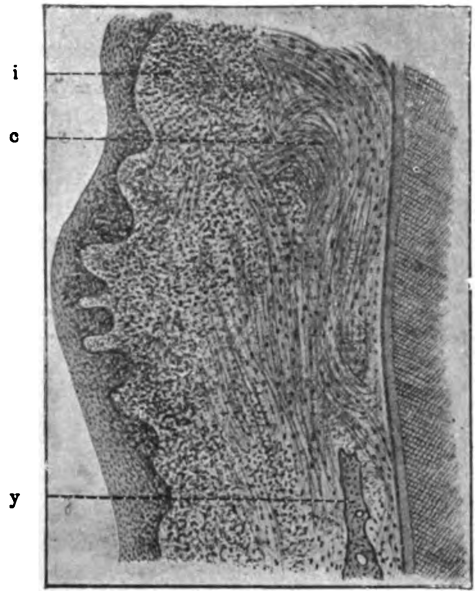


(*By courtesy of the "British Medical Journal."*)

FIG. 7.—Section showing initial stage in pyorrhœa. A, Breach of epithelium of gum margin; T, deposit of tartar in gingival trough; L, infiltration of gum with leucocytes; G, normal gum epithelium; D, dentine; C, cementum; P. memb., periodontal membrane; B, normal crest of alveolus.

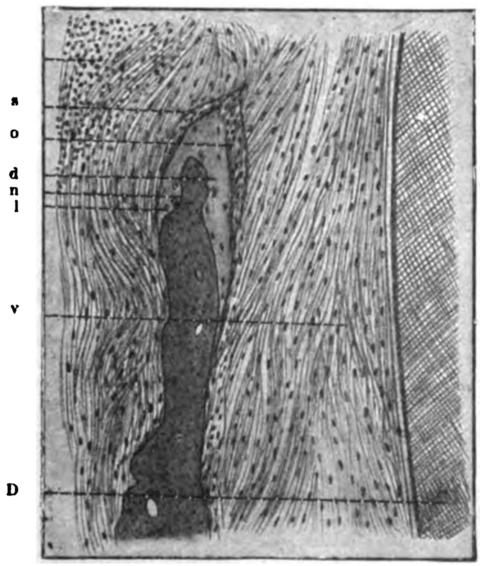
A variation is a porcelain facing to which a metal backing is cast. These gold-backed crowns are frequently mistaken by medical officers for the collar gold crown.

They are usually found on the anterior teeth and occasionally on the bicuspids. However close the fit to the root, the crown must be adjusted below the gum margin and, theoretically, without causing damage to the gingival trough. If left above the gum the enamel would decay, so it is entirely removed.



(By courtesy of the "British Medical Journal.")

FIG. 8.—This section shows that the inflammatory process proceeds from the periphery, namely, from gum towards the bone. i, Gum infiltrated with leucocytes; c, normal gum; y, normal bone.



(By courtesy of the "British Medical Journal")

FIG. 9.—In this section the implication of the bone in the disease is shown. i, Infiltration approaching from the gum towards the bone; s, bone transformed into fibrous intervening tissue; o, osteoid tissue; d, bone partially decalcified; n, bone corpuscles; l, line dividing the healthy from the unhealthy bone; v, periodontal membrane; D, dentine.

Chronic marginal gingivitis is very common round such crowns, which are most frequently fitted to teeth previously septic, and will be considered again in relation to root treatment.

Collar crowns are not made in Army dental practice, except in the special circumstance of absolute necessity for the retention of splints and fragments in gun-shot wounds of jaw with loss of substance.

We have so far examined purely local conditions confined to individual teeth and have indicated the possible extent of the toxin-forming surface of the periodontal membrane in each case.

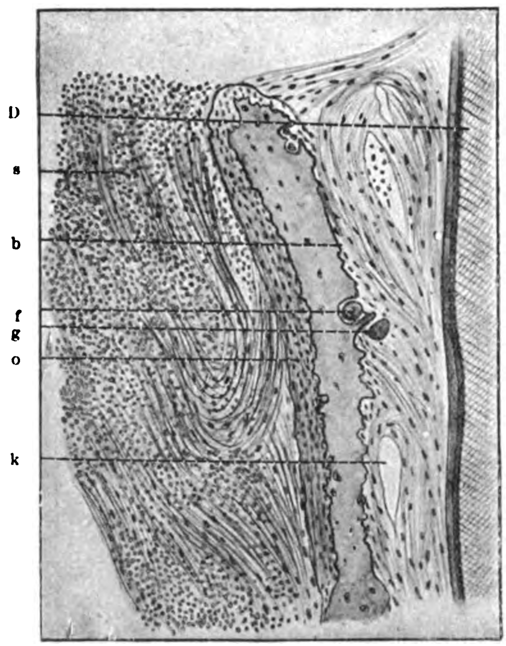


FIG. 10.—o, Outside of the tooth socket becoming connected with osteoid tissue; b, inside of the tooth socket showing Howship's lacunæ; g, osteoclasts; f, the so-called lacunar absorption of the bone is proceeding; the blood-vessels of the periosteum, k, are dilated, but the periosteum is but little infiltrated, the gum, on the contrary, shows considerable infiltration; s, reaching the bone of the socket; D, dentine. Magnified 180 times.

We must now consider that general suppurative periodontal infection known as "pyorrhœa" which, by virtue of its extent and chronicity, is responsible for so much widespread ill-health.

Pyorrhœa alveolaris embraces a series of connected pathological processes, and for the purpose of this paper may be regarded as a local periodontal infection of a suppurative character, affecting several or all the teeth in the mouth, the initial cause being injury to the cervical gum by food debris and due to the character of the diet of the present day.

The earliest changes in the gingival trough are similar to those already

described, but the subsequent pathology[1] is different and may be summarized thus:—

(1) The periodontal membrane is slowly destroyed in spite of its attempt to form a barricade of granulation tissue. The circular ligament disappears and the crest of the alveolus is involved (figs. 7, 8).

(2) This crest of bone is first decalcified, then transformed into an osteoid tissue and subsequently into a fibrous intervening tissue (figs. 9, 10).

(3) The deeper portions of alveolus containing bone-marrow are rapidly absorbed by a process of rarefying osteitis, in which "giant cells" are very active (fig. 11).

(4) Bone infection is not limited to that in contact with periodontal

x

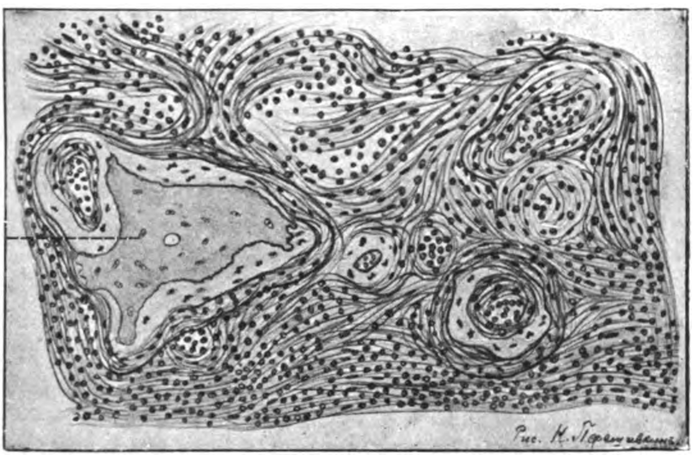


FIG. 11.—This section shows the concluding stage of the development of the disease in the marrow part of the bone; bony laminæ are absorbed and transformed into fibrous connective tissues very strongly impregnated with inflammatory infiltration. There is a sequestrum (x) to be seen which is beginning to be absorbed from the periphery. Magnified 360 times.

membrane, but spreads laterally and in depth, involving the external and internal alveolar plates and even the body of the maxilla and mandible, *producing not an area but a cubical content of infected bone* (fig. 12).

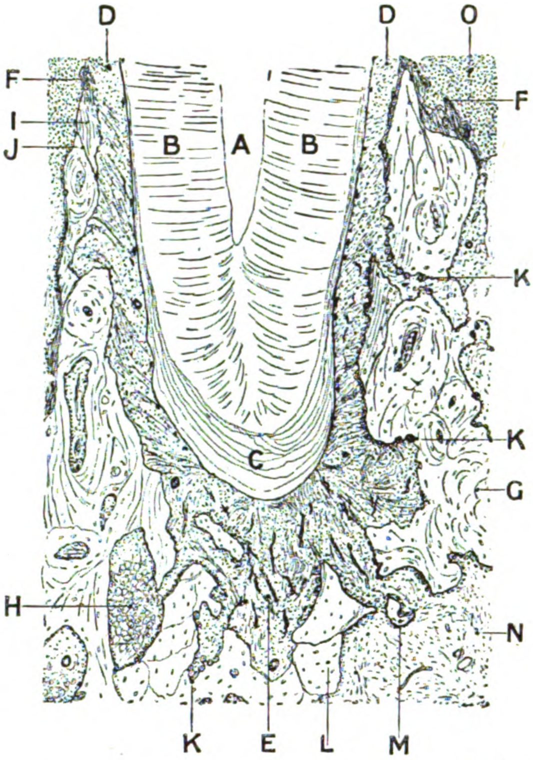
These pathological changes are very clearly indicated in figs. 7 to 12, which present the earliest, intermediate and last conditions as a connected series.

Concurrently with these changes outside the tooth, the cementum is infected from the periphery inwards, and this infection spreads into the dentine via the dentinal processes. The pulps of teeth involved are always affected, and the apices of such teeth are translucent when held up to a bright light. Bone recession precedes gum recession, the latter being

[1] J. F. Colyer, "Dental Surgery and Pathology," condensed from pp. 581, 582.

no indication of the extent of the former, which is often surprisingly extensive, even in young adults. Pockets are thus formed, from which a free flow of pus is obtained, but it must be noted that the disease may have progressed very extensively before this classical symptom is evident.

Pyorrhœa thus involves four structures, viz., periodontal membrane, gum, bone and tooth, from each of which bacteria and toxins are absorbed into the system.



(*By courtesy of the "Lancet."*)

(From a drawing by Mr. A. Hopewell-Smith.) Showing extensive changes in bone of jaw and investing tissues.

FIG. 12.—A, Pulp cavity; B, dentine of tooth; C, hyperplastic cementum around apex of root; D, periodontal membrane, greatly thickened—hyperplastic; E, indifferent tissue at apical region greatly increased in amount; F, free edge of bone of socket becoming converted into fibrous intervening tissue; G, bone of socket presenting earliest signs of osteoporosis; H, large osteoporotic space in bone of jaw filled with bone-marrow; I, bone of socket partially decalcified and converted into osteoid tissue; J, junction of living with decalcified bone; K, osteoclasts producing lacunar absorption; L, bone of jaw only slightly altered by disease; M, sequestrum undergoing peripheral absorption; N, soft, cancellous tissue slightly changed from normal; O, inflammation of gum at neck of tooth.

It is important to obtain some idea of the pus-forming area. In an advanced case involving thirty-two teeth, it has been estimated that the periodontal membrane area, allowing for loss in early stages, is twenty square inches. While such a condition is rare, frequently ten or fifteen

teeth are involved, presenting an area from seven to ten square inches. The surface area of infected alveolus is approximately the same, but here we must remember that the infection produces a cubical content of infected bone many times greater than the roots of the teeth involved.

The free margin of infected gum also presents an extensive pus-forming area, and the histamins from the infected pulps of teeth are absorbed via their lymphatics.

While there is a free flow of pus into the mouth, it must be emphasized that a considerable volume of toxins and bacterial products is absorbed via the lymphatics of the affected tissues and particularly from the deeper medullary spaces of the bone.

When it is considered that the disease may be present for long periods, it is not astonishing that so much general ill-health has been attributed to it.

(2) *The Internal Path of Infection of the Periodontal Membrane.*

This implies direct infection of the periodontal membrane via the apical foramen, following sepsis or injury of the pulp.

The pathological changes in the membrane and contact tissues following such internal infection are either (*a*) *productive*, or (*b*) *destructive.*

(*a*) *Productive Changes.*—There are three, viz., cementosis, abscess sac, granuloma.

Cementosis is an increased production of cement due to the cementoblastic reaction of the cement cells (fig. 2, a) produced by the histamins or toxins from the periapical infection.

This thickening of cementum is indicated in the radiogram when it is often quite unsuspected, and is an important symptom of chronic periodontal irritation.

Abscess Sac.—When suppuration occurs on the inner surface of the periodontal membrane, it may gradually expand the latter and absorb the bone, thus forming a sac. The inner surface is lined by granulation tissue and its wall gradually thickens and becomes more fibrous. It most frequently remains attached to the tooth on extraction and is found chiefly at the apical region. It is not uncommon, and I have over twenty specimens, most of which were the size of a small pea, in the recent state.

Granuloma.—This differs from the sac in structure, consisting of a solid mass of granulation tissue, and is regarded as a proliferation of the epithelial cell nests (fig. 2, b). Controversy rages as to the pathogenicity of the sac and granuloma. The odontogram, while indicating a periapical bone absorption, gives no hint as to the nature of the soft structure which is contained in the dark area between tooth and bone. The present opinion regards the sac, at any rate, as a highly pathogenic lesion from which toxins and bacteria may be absorbed by the lymphatics.

Destructive Changes.—Chiefly absorption of the root by a process of rarefying periodontitis, produced by the cementoclastic reaction of the

cement cells. A considerable part of the root may thus be destroyed, the absorption being either smooth and continuous, or rough and irregular.

While caries is not dealt with in this paper, we must briefly consider the question of the treatment of teeth with putrid pulps resulting from pulp infection due to caries. Such a tooth is commonly known as "septic," and presents a cavity filled with food debris, under which is a putrid pulp chamber and root canal filled with necrotic matter, this condition usually being present for some time before treatment is begun, and necessarily involving the periodontal membrane. It offers a challenge to the dental surgeon, and he is loth to extract it, and until very recently the usual routine treatment carried out was to remove all caries and infected material from the body of the tooth, enlarge the root canals by suitable instruments to remove infected dentine, and seal into the cavity powerful formalin dressings which were changed at frequent intervals. When the last dressing was considered to be free from any abnormal odour, the tooth was judged ready for conservation.

It must be clearly emphasized here that such infected teeth which have received this treatment are the most potent source of systemic infection from the mouth. Such an unscientific guide as the olfactory sense is now recognized as hopelessly inadequate, and every possible avenue is being explored in the attempt to render such treatment more satisfactory.

Odontograms are taken before and during treatment; root dressings are bacteriologically examined until the last one gives no growth on culture media; the apices are sealed up as far as improved technique allows and checked by radiograms.

The non-irritating dichloramine T and acriflavine compounds are being tried in root treatment, and a few enthusiasts are experimenting with the lactic acid *Bacillus bulgaricus*, on account of its markedly acid reaction which destroys the streptococci in the septic canals while itself remaining non-pathogenic. This last treatment is an attempt to use some innocuous organism in place of those antiseptics which are powerful destructive irritants.

It cannot be said that dental surgeons are not alive to the seriousness of the attack by the medical profession on root treatment, but they are loth to sacrifice every septic tooth to the forceps. But the very nature of the tissues and their inaccessibility render direct sterilization impossible. Both hard and soft tissues are deeply impregnated by bacteria and their toxins, as the result of their protoplasmic continuity, and after every possible bacteriological and radiological test has been carried out, it cannot be said definitely that there is not some residual infected hard and soft tissue.

The position is summarized thus by Price and Mouldenhauer, after an exhaustive research into the possible sterilization of septic teeth :—

[1] (1) "Infected dentine and cementum are not readily sterilized by

[1] *Dental Cosmos*, October, 1919.

medication even when the amount of medication is largely in excess of the mass of tooth structure.

(2) "The sterilizing agents contained in root dressings very readily and rapidly lose their disinfecting power.

(3) "The most efficient agents, silver nitrate and formalin, are very objectionable, the former by its discoloration and the latter by its destructive and irritating properties.

(4) "The results show that an exceedingly small percentage of teeth that have been treated by the dental profession in the past have actually been sterilized. Nature is, and has always been, very tolerant, and much of the credit that has been given to and taken by the dental public for sterilization of infected roots has been due to Nature for her kindness in tolerating, at least without local irritation, what is probably an almost universal condition of infection."

It may be argued that there are tens of thousands of such treated teeth in the mouths of people who show no constitutional symptoms. This will be granted, but they are potential foci of infection from which toxins are directly absorbed by the lymphatics, and preventive medicine rightly demands their eradication.

When it is remembered that practically every crown—collar or flush—is fitted to such a potential or actual focus of infection, it will be realized that such means of conservation is but an insult to injury and cannot be too strongly condemned.

It may be of interest here to record that, during the last three years at Millbank, I have extracted 180 collar crowns and thirty-nine flush crowns from officers who were either hospital patients or otherwise receiving medical attention for some disability, and also twenty-eight collar crowns from R.A.M.C. officers at their own request, a most encouraging sign of their appreciation of the dangers of such treatment.

In over 90 per cent of these teeth the local symptoms of an infected periodontal membrane were obvious, and in every case both the exterior and interior of tooth were foul-smelling. There is no better way of convincing the patient that such teeth are definitely harmful than by the test of his olfactory sense.

Mention must briefly be made also of the vicious circle set up by the gingivitis so frequently resulting from systemic diseases, such as :—

(1) *Acute infections*, as in the enteric group, cholera, dysentery, acute rheumatism, malaria.

(2) *Nutritional disorders*, as gout, diabetes, chronic rheumatism, scurvy, anæmias.

(3) Those resulting from the use of *toxic drugs*, such as mercury, lead, iodides.

In all these conditions there is some degree of gingivitis which leads to loss of gum margin and its sequelæ, opening up the periodontal membrane to infection. This is particularly the case in the acute conditions men-

tioned above. The marked decrease in quantity of saliva which invariably occurs, aided by the stagnation of food particles round the teeth and the much lowered tissue resistance, render the gum margins very susceptible to infection, and an extensive and sometimes acute gingivitis is set up during the illness.

On recovery, it is discovered by the patient that his gums have retracted, are soft and tender, and that food impacts between the teeth, setting up a vicious circle, the effects of which we have noticed. I have seen an extensive loss of gum, periodontal membrane and crest of alveolus resulting from an attack of typhoid fever of six weeks' duration, and simulating a chronic generalized pyorrhœa of many years' standing.

The importance of this gingivitis is that the tissues destroyed are never replaced in their entirety, and that it is only a question of time before a true pyorrhœa is established.

Of the acute oral conditions for which the soldier often seeks the medical officer's advice, two must be mentioned in particular. Firstly, the acute alveolar abscess, which, if untreated, "goes down" in due course and leaves a chronic sinus which may or may not give rise to local symptoms, but, nevertheless, is constantly discharging pus into the mouth, while at the same time some of its toxins are absorbed by the lymphatics of the invisible infected tissues. Secondly, the acute specific ulcerative gingivitis known as "Vincent's angina" or "trench mouth," which, if left untreated, may eventually be overcome by the barrier of granulation tissue set up by the gum and periodontal membrane, but which most commonly causes extensive destruction of the investing tissues before this occurs, and here dental sepsis is fully and rapidly established.

(*To be continued.*)

ON FOOD AND HEALTH.[1]

By MAJOR-GENERAL SIR WILFRED BEVERIDGE, K.B.E., C.B., D.S.O.

THE prosperity of a country depends upon the physical, mental, and moral character of its population. The limit of perfection in any of these characteristics which can be attained by the individual is governed by heredity, but within this limit *nutrition* plays a most important part.

As Waters has shown, the upper limit of the size of an animal is determined by heredity. "The stature to which an animal may actually attain, within this definitely fixed limit, is directly related to the way in which it is nourished during the growing period."

It is evident, therefore, that the most effective lines on which preventive medicine can advance is by bringing about a better state of environment and nutrition for the growing child, and by maintaining the health of the adult by adequate and suitable food. Nutrition is concerned with the promotion of health, and a condition of health is to the individual the greatest asset in the prevention of disease.

A state of malnutrition, so much in evidence even to-day, especially among children of the poor, is due not only to a lack of sufficient or the right kind of food, but also to a lack of the necessary vitamins and mineral salts. Other faults are connected with ignorance of dietetics and proper methods of preparation and cooking of food. It is unfortunately only too common to see young children subsisting on a diet composed almost entirely of carbohydrate or starchy food and sugar, when, to obtain normal growth and weight, food derived from animal sources, such as milk, meat, eggs and butter, is absolutely essential.

The growing child requires protein or nitrogenous substance for growth and repair of tissue : to provide for its restless energy, fat and carbohydrate, and for all the functions of cell metabolism and glandular secretion, a sufficiency of mineral salts and vitamins. Fat is a most important constituent of the diet of children, and is best given in the form of milk, which is very nearly an ideal food, not only because it contains the proximate principles in the right proportion, but also because it contains the life-giving vitamins, chiefly A and B, and the necessary salts, especially calcium, so greatly concerned with the nutrition of the blood, bones and teeth. Milk should form a considerable part of dietaries of children, and should not be stopped when the first dentition is over, but should be continued possibly up to puberty. One pint of milk daily is none too much for children between 6 and 14 years. Whenever possible, fresh cows' milk should be used and from cows which are pasture fed, since the green parts of plants contain all the vitamins. How often is the value of milk spoilt

[1] Reprinted from the *Journal of the Royal Sanitary Institute.*

by the practice of stall-feeding cattle in winter on artificially prepared cake and similar prepared food which, while it increases the milk supply, depreciates the vitamin content.

Sterilization of milk may have the same effect as regards vitamin B and C. Milk sterilized at a temperature above that normally employed, at 145° F. for thirty minutes, or 165° F. for five minutes, when prolonged, has produced scurvy in children.

Reheating pasteurized milk completely destroys the fat soluble A vitamin. One must remember also that manufactured milk such as condensed unsweetened whole milk and dried milks, although of considerable value in infant feeding, and for many other purposes, may be deficient in vitamins C, and therefore for infant feeding it is advisable to give daily a small quantity of orange, tomato, or swede turnip juice, to supply the C vitamin which gives not only protection from scurvy, but has influence on growth.

One is rather inclined to regard ignorance as to the proper method of feeding, which incidentally gives rise to dental decay, as one of the modern defects of civilization. The evil effects of malnutrition in childhood are likely to be maintained throughout adult life, and often cannot be remedied later, even under conditions of regulated diet and improved conditions of life.

Malnutrition, in addition to the absence of sunlight and suitable environment, is due to the neglect of proper feeding either in kind or quantity during childhood and adolescence, and is evidenced, apart from the presence of actual disease, and other obvious defects, by a lack of proportion of weight to height, poor teeth, dull intellect, and liability to contract disease.

Adenoids and enlarged tonsils, nasal obstruction, and many developmental defects, which though previously considered as separate diseases, are now generally accepted as part and parcel of malnutrition. One of the most valuable tests of health in the growing child is an evenly balanced physical development. In regard to the adult, the changed conditions of life at the present time has brought about altered conditions both of cooking and in the variety of the sum total of the food of our workers and others in large towns and cities.

For example, bread and butter has largely replaced oatmeal porridge in Scotland, a fact to be deplored, for oatmeal is a valuable food rich in vitamins and mineral constituents.

A century ago, although in many instances the amount of food was insufficient for requirements, the average worker lived almost entirely on a diet of fresh food, milk, vegetables, oatmeal, cheese, butter and wholemeal bread, some bacon and possibly a weekly indulgence in meat, while all babies were breast-fed. Such food when supplying sufficient fuel value for the needs would contain all the vitamins so essential to health. The change to a diet common nowadays, which involves using sterilized milk,

tinned foods, over-milled flour with a deficiency of fresh vegetables and fruits, and the adoption of the prolonged continental type of cooking, is detrimental to health. In fact, a large proportion, far too large, of our daily food consists of unnatural or manufactured food, containing none of the vitamins.

Except in a very few cases, any particular food we commonly eat does not contain all the vitamins, and hence a mixed dietary is necessary, and is characteristic of mankind, and a balance of vitamins is required in proportion to the amount eaten. All our food need not contain vitamins, but it is necessary that a certain percentage of the bulk should provide vitamins, in the right amount, and kind. If one eats a good mixed dietary of natural food, properly cooked, it should contain all the vitamins and mineral salts the body requires, and one then need have no further anxiety on this question of vitamins.

We are all aware that resistance to disease is enhanced in the well-fed individual, and never was this better shown than in the Great War, when the low incidence of infectious disease among our troops in France can very largely be ascribed to the care and attention paid to maintaining a full and adequate ration during the whole period of the war. The reverse was seen in the starving civil population of enemy countries, and even among the Allies. A soldier is not well fed on tinned meat and biscuits as former experience has shown ; never is it so important that the vitamin factor should be present in the food than under the conditions of Active Service in the field. Scurvy and beriberi, war œdema, and intermediary stages of fatigue, depression, headache, indigestion, and melancholia are all associated with lack of vitamins.

Findlay has shown that a lack of vitamin B tends to lower the temperature of the body, and diminish the number of leucocytes in the blood, thus enfeebling the resistance to disease. Again, the amount of vitamin B, a vitamin which is present in eggs, internal organs, nuts, yeast, wholemeal, fish roe, milk and vegetables, must also bear a definite proportion to the amount of food eaten, since it is intimately concerned with the processes of digestion, the utilization of food in the body, and the prevention of intestinal auto-intoxication. Vitamins have also another function, since it has been shown that they may act on nutrition through the ductless glands, and influence their secretion. It is intresting to note that for the proper functioning of the ductless glands of the body, such as the thyroid, the presence of vitamins is essential.

Although a lack of vitamins may cause such diseases as beriberi and scurvy, seldom seen in this country, and certainly not in people who subsist on a good varied diet of natural food, there are also due to the same cause intermediate stages of lowered vitality which may be passed unrecognized. A general lowered vitality can often be traced to deficiency, or inadequate dietary, and such diseases in children as rickets and infant scurvy are most probably due to some form of vitamin deficiency. Certainly a sufficient

supply of the fat-soluble vitamin is necessary to insure a proper deposition of calcium salts in the bones and teeth. Hess and others have laid stress on the value of cod-liver oil and sunlight in the treatment and cure of rickets, and McCollum has reported a new vitamin called D, the absence of which favours the development of rickets. Although it exists in cod-liver oil it is distinct from the soluble vitamin A. Lately it has been shown that certain fats deficient in A vitamin, if exposed to sunlight, develop an antirachitic property.

We may take it that the fundamental protective food substances are milk, eggs, green vegetables, and fruits, and these should form a certain part of every diet, especially that of infancy and childhood.

Undernourished people, or those whose vitality is below par, should reconsider their dietary and make sure that a proportion of natural foods, rich in vitamins, such as cabbage, carrots, onions, milk, eggs, cheese, wholemeal, peas and beans, kidneys, liver, sweetbreads, nuts and fruit, are plentifully represented.

It is not unnatural that these vitamins, which exist in such minute quantities in all living organic matter, are easily destroyed by exposure to air, to heat, drying, ageing, and by the presence of alkalies. They are apt, therefore, to be destroyed in methods of manufacture and preservation of foods and also during processes of cooking. When we think of it, a large proportion of our daily food consists of manufactured food, such as tinned foods, cocoa, tea, coffee, sugar extracts, custard powders, salted and potted meats, margarine made from vegetable oils, white flour, oil, sago, barley, tinned and preserved fruit, and vegetables, and thus how necessary it is to include some of the natural vitamin-containing foodstuffs already mentioned.

Prolonged cooking is fatal to vitamin C, whether in meat or vegetables, but vitamin B is not so sensitive, and is not destroyed by ordinary cooking. The degree of heat in itself is not so important in the destruction of vitamin as heat plus exposure to the oxygen of the air. Vitamin A is very sensitive to heating in air, as, for instance, melting butter, or frying in an open dish, but if milk is heated or pasteurized in a closed vessel the vitamin A is not affected. The C vitamin is also destroyed by alkalies, such as soda, so often used in boiling vegetables. The fat soluble A vitamin is happily not affected, since, were this the case, emulsions of cod-liver oil would be valueless.

It is a well-known fact that the public has a partiality for coloured foods: yellow milk and butter, green vegetables in preference to the white varieties. Like many other fixed ideas, this predilection is supported by scientific fact. Natural yellow milk or butter contains more vitamin A than white, green vegetables more vitamin C than the bleached varieties. The yellow or swede turnip is rich in vitamin, while the white turnip contains practically none. The reason is, that probably the carrotin or yellow pigment present in yellow or green vegetables acts as a light filter in the growing plant, and so favours the conservation of the vitamin.

In addition to the study of the vitamin it has been shown that a deficiency of mineral salts, and especially certain chemical elements such as iodine and calcium, have an important bearing on nutrition ; a lack of these may be responsible for both mental and physical defects, and further, a deficiency of one may result in loss of value of another. For example, the metabolism of calcium is dependent to some extent on the presence of iodine.

Now the thyroid gland is greatly concerned in metabolism, especially with growth in the young animal, and also with heat production. According to David Marine, if the iodine content falls below 0·1 per cent increased vascularity and cell hypertrophy commence to take place in the gland. Thyroid insufficiency leads to such diseases as simple goitre and myxœdema. These diseases may be caused by a lack of iodine in our food and water, and can be prevented by the administration of iodine. The ancient Greeks treated their cases of goitre by giving the ashes of sea-plants and sponges which are rich in iodine. Curiously enough although iodine may prevent the occurrence of epidemic goitre, it has no effect in a kindred disease, exophthalmic goitre, and recently doubt has arisen whether iodine given as a preventive of the one may not increase the incidence of the other.

As Dr. Barwise has pointed out, the secretion of the thyroid secures immunity from germ infection, and it is concerned also with the metabolism of fat. Diet rich in fat can quickly exhaust the iodine in the thyroid. If iodine is insufficient fat cannot be satisfactorily oxidized in the body and is stored, giving rise to obesity.

It has been shown that there is more iodine in wheat from non-goitrous districts of America than from wheat in what they term the goitrous belt. We all know that white flour and white bread contain no vitamin, it having been removed with the germ and bran during milling, but iodine is also absent. Here again we have evidence of the greater value of wholemeal as compared with our white refined flour.

Since the thyroid gland is concerned not only with the physiological functions of the body and in the promotion of gastric and intestinal secretions, and the important raising of the bodily resistance to microbic infection, it is evident that a certain amount of iodine should be obtainable from our food or water. It is only required in infinitesimal quantities, fifty milligrammes being sufficient to allow of the normal functioning of the thyroid gland for one year.

Foods containing iodine include cod-liver oil, salt-water fish, water-cress, green leaves, legumes, eggs, and oatmeal, all of which are also rich in vitamins.

Now a word as to the necessity for calcium or lime in our dietary. Calcium is concerned not only with the constitution of our body tissues, our teeth and bones, but it is necessary for the clotting of blood when exposed to the air and the digestion of fats.

Calcium exceeds any other inorganic element of the body, and about

ninety-nine per cent of the total amount is found in the bones and teeth. A deficiency of calcium is more injurious to the growing child than to the adult, and many cases of arrested development in the child may be traced to this cause, often from a lack of calcium in the diet.

Calcium salts are also necessary for the regulation and action of the heart muscle. In women the calcium requirements are greatly increased by maternity, and between the third and sixteenth year it is stated that children to insure a normal rate of growth require a daily storage in the system of 0·1 gramme, which means that the food must contain over and above this amount daily.

The parathyroid gland is greatly concerned with the metabolism of calcium, and also with the calcification of our teeth and bones. We take a considerable amount of calcium in our drinking water, and hard waters are, perhaps, on the whole, better for drinking than soft, but the harder the water the more iodine is required to assist the metabolism of the calcium in the body. In regard to the calcium in our food, here again the mixed diet of the present day is often more deficient in calcium than in any other of the salts. Meat is not a source of supply. White bread, sugar, polished rice, and other milled cereals, lose in the process of milling, perhaps above half their calcium. Fruit and vegetables are rich in calcium, also eggs, beans and peas, almonds and nuts, but the richest source of calcium is to be found in milk and cheese. Meat contains 0·12 gramme per cent and cheese nearly one per cent. There is more calcium in a pint of milk than there is in a pint of lime water; therefore, to add limewater to milk with the idea of increasing the lime content is obviously erroneous. By far the most practical means of adding calcium to our dietary is to include a certain amount of milk in our dietary and especially in that of the growing child.

I have now indicated some of the defects connected with what are termed the regulating foods, vitamins and mineral salts, but to these must be added water and foods containing ballast or bulk such as vegetable fibre contained in whole wheat, and vegetables which assist in regulating the gastric and intestinal action. A certain supply of hard food is also necessary to insure vigorous use of the teeth, such as crust of bread, toast, nuts, and fibrous vegetables.

In regard to water, one has to remember that two-thirds of the body weight is made up of water, and Ranke has recently shown that, contrary to the general belief, the water content in the body of old people is increased, and as an American writer has put it, we can no longer speak of "a dried-up old man." There is a tendency among most people to drink far too little water, and except in the case of people suffering from heart and kidney disease, to balance the daily loss, at least six glasses of water, or the equivalent, are required daily. Many of the minor aches and pains, and some forms of lumbago, and rheumatic pains, may be traced to an insufficiency of water. A glass of hot water, especially if made slightly

alkaline, and taken either in the early morning, or at bed time, is of distinct value is assisting the kidneys and skin to remove the poisonous products of the body.

Some doubts often arise as to whether one should drink with meals or only between meals. Many animals and birds drink immediately after eating. It has been contended, that since no liquids are absorbed in the stomach, liquids taken at meals are retained, thus diluting the gastric juice, delaying digestion and promoting fermentation in consequence. On the other hand, water taken at meals is beneficial in diluting the gastric juice, which in many people is too concentrated. It assists deglutition, especially of dry foods, and stimulates the flow of gastric juice and the contraction of the walls of the stomach. On the whole, then, there are certain advantages in a moderate quantity of liquid being taken with, or shortly after meals, especially in those who suffer from an excessive gastric secretion.

In conclusion, to preserve our health, and to lessen the tendency to malnutrition, especially in infancy and childhood, we must be prepared to adopt a more natural form of food, and one which contains the accessory food factors in a normal proportion; for example, 2·800 grammes of food-stuff containing the anti-neuritic vitamin B, per week, is required to protect against beriberi. The present excessive use of manufactured foods must be overcome, or minimized by the inclusion in our dietary of a certain proportion of green vegetables and fruit, and cereals derived from wholemeal grain. In childhood a certain proportion of the food should consist of that derived from animal sources, such as milk, eggs, meat, cheese and butter. An excess of sugar and sweet foods should be avoided. Sugar contains no vitamin, and although a valuable and rapid energy producer, in excess it is apt to cause fermentation, with resulting hyperacidity and general digestive disturbance. We must also consider more simple methods of cooking, and above all, avoid prolonged methods of cooking in any shape or form.

STATISTICAL INVESTIGATIONS WITH SPECIAL REFERENCE TO THE INCIDENCE OF MALARIA IN LAHORE CANTONMENTS.

By Major A. C. HAMMOND SEARLE, M.C.

Royal Army Medical Corps.

Late D.A.D.M.S.(S.) Lahore District.

The cantonments of Mian Mir in the Punjab enjoyed for so many years an unenviable reputation as a hotbed for malaria, and other diseases, the heritage of tropical climates, that a time came when it was apparently considered advisable to "lose" Mian Mir, and there came into being, on the same site, Lahore cantonments.

Unfortunately the laudable object aimed at was not entirely achieved, and Lahore cantonments are still a black sheep among cantonments from the point of view of health, and of those whose work and interests lie in the direction of "Disease Prevention and Preservation of Health."

With the object of limiting to the maximum extent mosquito breeding in cantonments, a drastic change of policy was introduced in 1904, and complete cessation of irrigation in cantonments was ordered.

The net result of this policy was the gradual production of a barely habitable desert, in which life was plagued by vast and never ending clouds of dust raised by every animal or vehicle, not to mention the undue frequency of true dust-storms, which together make life miserable in this station.

Statistically it was claimed that there had been considerable reduction of malaria as the result of no irrigation, but it must be confessed that the claim was far from being generally accepted, and some senior combatant officers and medical officers, who had prolonged or repeated experience of Lahore cantonments, were inclined to be sceptical of the alleged improvement.

The misery of the "dry period" was not forgotten, and even if there had been a fall in the malaria incidence, it was doubtful whether it had been worth while at the cost of comfort; and whether there had not been a concurrent increase in other diseases, notably respiratory, as a result of the ubiquitous and ever present dust.

It was with the object of answering at least some of these questions that this work was undertaken.

Perusal of the published Health Statistics for India as a whole, and Lahore district since 1900, emphasizes very markedly the changes in methods, nomenclature, diagnosis, etc., occurring over so prolonged a period.

San
fe
15
16
2
1

During the earlier years, 1900-1907, malaria cases are to be found under the headings, intermittent and remittent fevers, whilst simple continued fever (S.C.F.) comprised practically all other fevers that were not enteric or malaria.

The introduction of microscopical diagnosis of malaria (1904-1905), with its early imperfections in technique, resulted in an apparent fall in the malaria incidence, coupled with a corresponding increase in that of simple continued fever, to which those cases of malaria were relegated in which parasites were not discovered in the blood.

By 1908 differential diagnosis between malaria, influenza, sandfly fever, etc., had become well established and the term pyrexia of uncertain origin (P.U.O.) was introduced to cover obscure fevers of short duration still undifferentiated.

The terms intermittent, remittent and simple continued fever were necessarily discarded as valueless.

The object of this investigation has been to ascertain to what extent, if any, it is justifiable to ascribe a direct improvement in the incidence of malaria to the cessation of irrigation in Lahore cantonments (1904-1917).

It had previously been shown by Colonel Kelly, I.M.S., that during the "dry period" a distinct lowering of incidence could be charted out, with reference to the combined incidence of malaria (intermittent and remittent), simple continued fever, pyrexia of unknown origin, sandfly fever, considered as a group, probably containing the great majority of the cases of malaria that occurred.

Reference to these charts showed the incidence to have been as follows:—

1903—04 inclusive ..	..	..	878·4 per mille
1904—17 ..	..	..	..	399·0 ,,
1918 to date	..	..	..	726·7 ,,

In searching records, certain factors have been brought to light which cannot have failed to influence statistics to such an extent as largely to nullify their value.

In 1902 a great fall in the incidence of malaria occurred in Lahore cantonments, the reason for this, even if correct, cannot now be ascertained. It is noteworthy that this fall was markedly greater than that which occurred in the incidence for all India.

Again, in 1922 there was throughout India, and equally in Lahore cantonments, a similar marked fall in the incidence of disease generally and especially of malaria.

Thus unexplained falls in incidence occur and must be taken into account.

As is well known they are frequently balanced, as was the case in 1923, by subsequent increased incidence, which may assume epidemic proportions.

In Lahore cantonments the fall in 1902 to 270 per mille had been

similarly followed by a return to an incidence of 1,006 per mille, approximating more nearly to the incidence of 1,059 and 1,354 per mille, which had obtained in 1900 and 1901 respectively.

During that year (1902) figures for all India showed a small decrease only, so that it would appear that the cause of this great variation was in this case to be found in Lahore cantonments.

The year 1904 saw another great decrease of incidence, from 1000·6 per mille (in 1903) to 507 per mille, i.e., malaria was apparently halved, BUT this apparent improvement took place, as far as can be ascertained, *prior* to the cessation of irrigation.

In 1905 irrigation had ceased in Lahore cantonments, and there was shown a tenfold decrease in malaria (*vide* figures) from 507 per mille to 51·7 per mille.

It is unfortunate that the same year witnessed an enormous (and progressive) rise in the incidence of simple continued fever to 350 per mille.

It must be stated that this was very largely due to the fact that the microscope was in this year taken into general use as the routine criterion of diagnosis, and a very large (and unjustifiable) number of cases of malaria were thus relegated to the heading of simple continued fever owing to inability to discover the parasite.

The addition of the ratio of incidence per mille of malaria to that of simple continued fever during these years makes a considerable difference in the aspect of things.

Thus statistics for Lahore cantonments were as follows:—

			Malaria		Simple continued fever		Total
1904	..	..	507	Plus	77	..	584 per mille
1905	..	..	33	,,	350	..	383 ,,
1906	..	..	236	,,	238	..	474 ,,

In addition to these records of admissions, perusal of the report of the Public Health Commissioner to the Government of India (1908) reveals the remarkable fact that from 1904-1908 no less than 25,668 cases of malaria were treated in barracks.

It will be obvious that any conclusions based on the admissions to hospital during the period in question (1904-1908) will be completely invalidated, and that no inference can be drawn from these data as to the influence of the cessation of irrigation on the malarial incidence.

It is necessary to state that with complete understanding of the method of transmission of malaria, treatment of this disease out of hospital was forbidden.

It will thus be seen that important deductions were drawn from the fall in incidence of malaria occurring in 1905, that this fall was accompanied by a very marked and corresponding rise in the incidence of simple continued fever (reasons given above), and the combined incidence of several fevers considered conjointly tends to modify considerably the remarkable

fall in the incidence of malaria, which was claimed to be the result of the cessation of irrigation.

It is also noteworthy that the fall began in 1903 and continued through 1904 to 1905—the first year after cessation of irrigation. The incidence of malaria rose again, however, in 1906.

These points do not appear to have been much emphasized in the past.

In an exactly similar manner the end of the "dry period" cut *across* a period of rise in malarial incidence which had begun two years previously (in 1915) and went on until 1921, after which there came the remarkable fall seen in 1922 (during the second wet period be it noted).

The year 1922 was extremely healthy; the year 1923 was one in which a tremendous epidemic occurred, and there is no reason to suppose that irrigation influenced incidence more, or less, in either of these two years.

As stated above, if, as would appear, 25,668 cases of malaria were treated between 1904-1908 as out-patients, i.e., not admitted to hospital, all deductions as to the incidence of malaria, based as usual on admissions to hospital, are valueless during that period.

It is incontrovertible that statistics have in the past been widely influenced by the use and abuse of the system of detaining patients.

This system not being in use in civil life, it will be readily understood that from 1914 onwards statistics were adversely affected by medical officers with limited experience of army methods admitting direct to hospital many cases that might without detriment have been treated in barracks or by means of detention in hospital for a day or so.

It accordingly became necessary after the Great War to circulate orders to the effect that these methods of treatment were not to be lost sight of.

Unfortunately, lack of experience and judgment resulted indisputably in a certain amount of abuse in this system.

In order to remove finally elements such as these, which tended to vitiate statistics, orders were issued in 1923 standardizing both treatment in barracks and the detention of patients in hospital.

At first a reaction ensued, and, by absolutely rigid adherence to a period of twenty-four hours, the object of the system was defeated, so that a little later a slight modification desired by most medical officers, and generally agreed to as the correct one, was ordered by Army Headquarters, and it may be taken that the accuracy of medical statistics in India was greatly enhanced by this definite standardization of the system of detention.

While the foregoing remarks tend to show that there is a possibility that more has been claimed from the cessation of irrigation in Lahore cantonments than can be justified statistically, it should not be inferred that the presence of irrigation is *per contra* entirely without effect on the incidence of malaria.

This is far from being the case, and it is indeed considered that the irrigation channels constitute a great danger, providing as they do, through seepage, vast numbers of breeding places for mosquitoes.

It is not proposed to enter into a lengthy discussion as to the nature of the anti-malarial measures indicated in Lahore cantonments, but the opportunity is taken of emphasizing the fact that, through lack of funds, anti-malarial measures on the present scale cannot be expected to effect material improvement in the incidence of malaria in this and many other cantonments.

By the grant of sufficient funds it may be possible to improve the totally inadequate drainage system, in which outstanding improvement is even now seen compared with former years.

Similar adequate funds are necessary to repair and keep repaired the defects in the irrigation channels.

By such measures, and attention to minor sources of danger, it is possible to reduce breeding places in cantonments, and thereby help to lessen the chances of infection.

A measure which the experience of the current year (1924) has further shown to offer very considerable hopes of success with regard to breeding places hitherto beyond the scope of local authorities, is the deep absorption pit, as advocated by Lieutenant-Colonel W. J. Mackenzie, R.A.M.C., now Director of Hygiene and Pathology, and the progressive extension of this method in Lahore cantonments is strongly indicated.

It is emphasized, however, that, in view of the density of the sources of infection in the shape of the native population of the bazaars, and the unrestricted breeding possibilities for mosquitoes just outside cantonments, the only measures offering any hope of real success must be on a scale hitherto unattainable, and would probably necessitate complete mosquito-proofing of barracks—coupled with all the other accessory methods which it is necessary to employ, as shown in those places (e.g., Panama Canal zone) where a really determined effort has been made to stamp out the disease.

My thanks are due to the Director of Medical Services in India for permission to publish these notes, which were collected solely with the object of giving a satisfactory reply to the General Officer Commanding Lahore District and other officers who were interested in a very controversial subject.

Statistical, meteorological and other data have been extracted from the Reports of the Public Health Commissioner for India, and Annual Reports of District Laboratories and Sanitary Officers.

It is regrettable that, owing to the long-continued adherence to a somewhat obsolete form of health report for all India on the one hand, and a multiplicity of individual efforts on the part of sanitary officers on the other, large gaps exist which could not be filled in, and it was not until uniformity was established, after the war, that it became a simple matter to extract the required information year by year.

THE BAHR EL MAGNOON.

By Major-General J. B. WILSON, C.B., C.M.G.

As one cast from the Corps by reason of age, and therefore no longer able to take part in its active affairs, I am reduced to the contemplative rôle of that white-bearded Arab who sat on his prayer rug observing the long bazaar, and gave thanks to Allah for the diversity with which he made his wonderful creatures.

In the course of these meditations it has occurred to me sometimes to wonder whether the young R.A.M.C. officer of the present day is sufficiently grateful for the admirable training he receives in his technical work, and more especially in general military duties and the Staff work of an army.

I gather from examination papers, "schemes" and general and special ideas appearing from time to time in the Journal that there is considerable diversity between the training given in these subjects in times past and that available now.

I remember being detailed for one of the earlier efforts at training of this kind. No doubt this occurred about the time it began to dawn on some pioneer intelligence in the War Office that France, Germany and the other European people were training their medical officers in those military and staff duties which they would have to perform in the Great War.

Evidently this prophet had suggested to the other great ones that the thing might be worth looking into—at all events on a small scale.

If the General Officers Commanding of the period panicked too freely it could be withdrawn.

If, on the other hand, it caught on, there was the kudos. And in any event, when the crash came, no one could say that the War Office had not done its best. There would be documentary evidence that all (or at any rate some) medical officers had been (more or less) carefully trained in Staff duties.

In fact it worked as if, in any case, the War Office would be on velvet.

The experiment in which I was implicated took the form of a "Staff Ride" in Egypt, where I was stationed at the time, and this exercise was personally conducted by the then General Officer Commanding the Command himself.

He was an officer with a distinguished record for gallantry in the Field, as well as for his unvarying courtesy and kindness to those serving under him, but not what could be described as a rapid thinker or as one unduly favourable to new ideas.

He held that the "Brains of the Army," or, in other words, the Staff, was the main thing, and the duty of the doctor was to keep the Staff in good health. He was on all occasions to analyse their water supply and their rations, and was to act as an unfailing dump for No. 9 pills and a perennial fountain of cough mixture.

The General Officer Commanding was rather a connoisseur in cough mixtures, as he considered that he suffered from slight chronic bronchitis himself.

If he could have conceived that a medical officer required some Staff training to enable him to carry on his duties for the welfare of the troops in his charge on the scale required for modern war he would only have regarded such an idea as a dangerous innovation, prejudicial alike to good order and military discipline and, therefore, to be stamped out without delay.

This was, therefore, the state of things when I was detailed for the Staff ride.

I do not, of course, know what correspondence took place between the War Office and the Command, but evidently something of a fairly definite nature, seeing that it resulted in the inclusion of a medical officer in a "Staff ride," and I was told off for the duty.

I consulted my immediate Commanding Officer as to whether I was to do the Staff work of the tour and work out the medical problems involved, or was merely to attend as medical adviser to the expedition, which consisted of some seven or eight healthy officers, doing a pleasant four days' tour in the Fayoum, during the best part of the cold weather.

My commanding officer said I was to do the former, but as a concession to local prejudices it might be a good thing to take a supply of medicine (including cough mixture) to keep the brains of the Army in good health.

The scene of action was that part of Egypt known as the Fayoum. For those who are not familiar with the country, it may be stated that the Fayoum is a large oasis or fertile tract some eight or ten miles west of the left, or western, bank of the Nile about fifty miles south of Cairo. Cairo of course being at the apex or southern point of the Egyptian delta. The Fayoum is connected with the Nile by the Bahr Yussuf, a canal which diverts Nile water to the Fayoum, fills its lakes and keeps it fertile. The canal is stated to have been Joseph's idea during his term of governorship in Egypt, and it is supposed that his provision against the "seven lean years" mentioned in the Bible really consisted in the fact that he found out that a considerable area of the Western Desert was a few feet below Nile level, turned the Nile into it per his canal, and hence the Fayoum.

The general idea set down in the book of the words was that the Staff were to consider themselves a British force driven out of the Egyptian delta, presumably by some local potentate of the period, and forced to retreat to the Fayoum and await reinforcements from India. Our duty was, therefore, to keep the enemy at bay until they arrived. The first

position to be held was on the north-east fringe of the oasis nearest to Cairo and the river, which would probably be the point first attacked by an invader.

Near this place was a little railway station, a terminus called Lahoun on the Fayoum Railway, within less than one mile of the edge of the cultivated land which here rose in a slight ridge at the junction with the desert. I gathered that this was considered the ideal position by the Higher Command.

Behind, and parallel with the position on the desert's edge, the map showed the line of the "Bahr el Magnoon," or "Lunatic's Canal," a branch of the Bahr Yussuf. It ran about half way between the railway and the fighting line, and parallel with the latter. I do not know who invented the name for this canal, but he certainly showed a turn of speed quite unusual among the Egyptian wits of the day.

All Commanders were to assemble on this ground, appreciate the situation, and make their dispositions accordingly. They were to state: (*a*) How they proposed to defend the position, and (*b*) To withdraw, per El Lahoun Railway, after having inflicted the maximum loss on the enemy; but before we were all exterminated, and in order that some one might be left to welcome the Sikhs on their arrival from India, the sappers were to strengthen existing bridges over the Magnoon and to provide others to enable the defending force to deploy rapidly on to the position from the station. After evacuation they were to destroy all bridges to stop the victorious progress of the enemy when they got to the canal bank.

Infantry and Royal Artillery were to get into, and out of, action by the same route, and I was to evacuate all wounded in a like manner by a theoretical ambulance train before the troops retreated. In fact a thoroughly compendious scheme.

It seemed to me, however, that these bridges might not improbably be a little crowded towards the end of Act II, and I thought it would not do any harm if I was to look at them more in detail. Obviously the Magnoon was the crux of the position.

Sappers were sitting in the little native village working out with knitted brows the quantities of high explosives required to demolish bridges. Commanders of guns and infantry were working out positions by the aid of maps, like so many budding von Moltkes.

It was obviously no time to be idle, so I thought I had better visit the canal. I therefore started from the station, walking towards the position, expecting to find the canal halfway, I would then cross by the nearest bridge. Unfortunately, however, this did not work out according to plan. I got to the position on the edge of the desert, but found no Magnoon Canal. Either I must be mad or I must have got to the wrong desert. However, compass bearings and the replies of such of the military toilers as could spare a second from their labours for conversation, all agreed that I had got to the right desert, and was in fact in the exact centre of the

stalls—or would be—when the overture commenced. All this was a bit distressing, but further inspection of the ground solved the difficulty.

The Magnoon Canal had no doubt, at some period of the world's history, run in the direction indicated on the map, in fact there was a broad ribbon of lighter green made through the wheat crops, showing what had been its course. That section of it, however, for some half mile or more behind the position had been filled up, some decades, or perhaps some centuries previously, and as a canal the Magnoon had ceased to exist.

That evening as we were dressing for dinner my commander, to wit, the General Officer Commanding the defending force, in actual life a cavalry captain, demanded my scheme. Rapidly glancing over it he said, "Look here! what's this? How are you going to get your wounded to the station? What about the Magnoon Canal?" I said I hoped to get them to the station (if there was any station at that time of day, which did not seem probable), but if there was I hoped to get them there by stretcher or ambulances and country carts, if available, provided the ground was not too soft; also that for my purpose the canal was negligible. I was told not to be silly but to look at the map. I then asked him if he had followed the canal behind the position. "No," he said, "not exactly, in fact I hadn't time. But! Oh, well, d—n it, look at the map."

"Quite," I said, "and very nice too. Only you can take it from me that the Magnoon Canal has ceased to exist all the way behind the position for years and there is wheat a foot high growing over its track."

"But, look here," said he, "this won't do; you have upset the whole apple cart. If this scheme of yours gets to the General Officer Commanding our name is mud." "What!" said I, "you don't mean to tell me that the General Officer Commanding doesn't know either?"

"I've already told you once," said he, "not to be silly. You go and do another scheme and put in the Magnoon Canal where it ought to be and don't let's have any more chat."

I made it so.

Our dear old General Officer Commanding went through all our papers after the excellent dinner they gave us at the Medinet el Fayoum Hotel that night. He considered that, taking them all round, they were performances of considerable merit, and reflected great credit on all concerned.

Let no one, however, conclude from this truthful tale that high-class Staff work was unknown in those days. In my humble opinion our R.A.S.C. representative gave a distinguished example of it on this occasion. He was a genial lad, a subaltern, whom we will call "Tibben" (if this should catch his eye I hope he will forgive me). The last time I saw him he looked a bit careworn but wore a full colonel's badges and a considerable row of well-earned decorations.

On this occasion, however, he toiled not, neither did he spin. He appreciated the situation to one milligramme, and the exact mental effort required to compete with it.

While we toiled he did nothing, and whereas our schemes went in on painfully filled sheets of foolscap, his was submitted on something which looked like the back of an envelope. He said it was the plan by which our force was to be kept in food and forage during the war. It ran as follows: "The only point from which this force can draw its supplies is Islamiyeh (or some such name), the nearest port on the Nile. At this point, therefore, the contractor Abdul has been ordered to concentrate the rations, while the agent Mahomed, will, at the same place, accumulate the forage."

"I presume, Mr. Tibben," said the General, benevolently regarding Tibben from over his eyeglasses, "I presume that these are imaginary gentlemen?" "Yes, sir," said Tibben, "they are."

———

A NOTE ON THE EVACUATION OF SERVICE CASUALTIES BY AIR.

By Captain J. C. BURNS.
Royal Army Medical Corps.

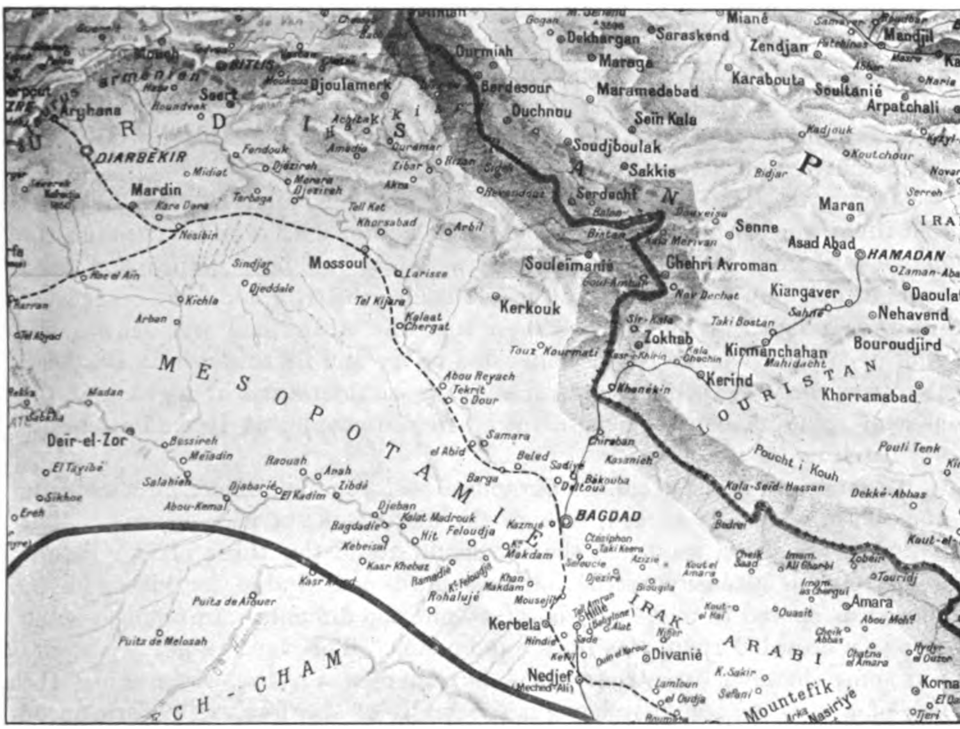
The article on "Aerial Transport of Service Casualties," by Wing Commander H. A. Treadgold, R.A.F.M.S., in the November issue of the Journal, must have been read with great interest by those officers of the Corps who had occasion to deal with the transport of casualties on the frontiers of Iraq.

To anyone with a knowledge of the difficulties encountered by punitive columns in the mountains of Kurdistan the record of the evacuation by aeroplane of 198 casualties from the remote and rugged valleys round Rowanduz to Kirkuk and then to Baghdad in 128 hours 45 minutes flying time, must evoke a feeling of admiration for the skill and resource of the pilots.

In contrast to this feat of rapid evacuation is the experience of a column in the Kurdistan Rebellion of 1919 when, entering Southern Kurdistan from the Persian border, we had to carry our sick for a period of fourteen days, most of the marches being over the mountain tracks of the Avroman Range. The methods of transport used were baggage mules, mule cacolots, and in one seriously ill case a mule litter and, as it was during the worst of the hot weather, the sick suffered considerable discomfort before they reached a field ambulance at Suleimanie. From this place the sick and wounded had a two-day journey over a bad road to a field ambulance at Kirkuk. The next stage was by motor ambulance, a distance of fifty miles across the "blue" to the Tigris at Fatah to reach the casualty clearing station at the railhead at Baiji, about twenty miles above Tekrit. As an example of the bad state of the road between the river and railhead it may be mentioned that another officer and myself being evacuated as stretcher cases had to turn out and help to push our ambulance car, an experience—performed as it was in the heat of a July morning—we could well have dispensed with. One can therefore more readily appreciate the remarks of Wing Commander Treadgold regarding the evacuation by air of the sick from the 1923 Kurdistan column that "none of the patients carried seemed to mind the method of transport, and the majority stated that they had enjoyed the experience."

In January, 1920, while up on the Syrian-Iraq frontier, I obtained a striking demonstration of the value of a Service aeroplane in evacuating a casualty. A section of the combined field ambulance to which I was attached was stationed at Ramadie and was responsible for the medical arrangements of the long and difficult lines of communication from Feloudja up to Deir-es-Zor, a distance of 300 miles.

The town of Deir-es-Zor, which is now in French mandated territory, was occupied by a small force of our troops after the Armistice. The continued occupation of this town was resented by the Arab nationalists in Syria, and in December, 1919, a noted irreconcilable—he is again very active in the present Syrian revolt against the French—Ramadan al Shallash of the Aquaidat tribe, made a sudden raid on the town and captured the garrison, which consisted of a half battery of L.A.M.B. cars and some local levies. No attempt was made to recapture the town but a force was sent to hold the small fort in the village of Abu Kemal, sixty



miles lower down the Euphrates. The Aquaidat, however, were so emboldened with their success that they attempted to repeat a similar coup at Abu Kemal. The day on which the small convoy with which the writer was travelling reached Abu Kemal was the day selected by the tribesmen for their attack, a fact of which we were made aware by running into a very effective ambush in the sandhills a couple of miles from the fort. The prompt arrival of an armoured car enabled us to collect our casualties and reach the fort.

Here we found ourselves in a position which must have been similar to that experienced by the French outposts in Morocco during the Riff revolt. One of our earliest casualties was a young British officer with a bullet

wound in the liver. There was difficulty at first in finding suitable accommodation for the wounded, for the fort was small and had to provide for a company and a half of Indian infantry, a battery of armoured cars, and other details, such as motor transport drivers, pack wireless unit and the Political Officer and his staff. The outer courtyard had to serve for entrenchments, sanitary area and cemetery, while the few living rooms had machine-guns posted at the windows. A store-room and the office on the ground floor were taken over for the British and Indian other ranks wounded, but the wounded officer had to remain perforce in the only available room in which eight of us were crowded together.

The tribesmen, by nightfall, had closely invested the fort and broken into the village, so that to the clatter of machine-guns, rifle fire and hand grenades, was added the pandemonium of pillage and murder from the bazaar. This state of affairs lasted three days when a flight of aeroplanes from Baghdad came over and bombed the enemy so effectively that the latter scurried off helter skelter some miles up river.

Among the officers in the fort were two R.A.F. pilots and an observer and there were two aeroplanes, one out of action with a bullet through the petrol tank, but the other was in flying order. These planes had been brought close up to the walls of the fort before the tribesmen had completed the investment. When it was seen that the Arabs had withdrawn, the pilot of the serviceable machine decided to try and fly through to Baghdad as it was more than likely that the Arabs would return at night and the nearest reinforcements—a regiment of Indian cavalry at Ramadie—would not reach us for ten days.

Learning of this I decided to evacuate the wounded officer by aeroplane and the pilot readily agreed, though the flight was not without risk. The patient's condition was such that he could stand the three or four hours' flight, but his retention in the fort was most undesirable, for, although no effort was spared to make him comfortable, the difficulty of nursing such a case in a crowded room was only too obvious. The usual landing ground was some distance from the village, but there was a level strip about the size of a polo ground just beyond the walls of the fort. Two armoured cars patrolled the broken ground beyond this in case of sniping, and the aeroplane was put in order as quickly as possible for the reception of the patient. The plane was a two-seater reconnaissance type known as R.E. 8. These machines are rather ancient and slow, usually referred to as "Harry Tates." We unshipped the observer's seat, but owing to lack of time and tools, could not remove the gun mounting or the tripod that supported the seat. A cushion from a Ford car was pushed into the cockpit so as to make an inclined plane for the patient to rest against, but his legs had to be thrust through between the bracing wires in the interior of the fuselage. The loading of the patient was difficult. The stretcher was lifted on to the top of the machine and tilted so that the patient was slid down on to the motor cushion. The adjusting of his legs in the cramped space caused

him pain, but he bore it well. Soft native quilts and blankets were packed round him. We watched rather anxiously as the machine raced across the ground, but the engine started misfiring, so the pilot had to taxi back to rectify the trouble. The second attempt was successful, and it was a cheer of relief that rang out as the plane took off and headed for Baghdad. The departure was "wirelessed" to Baghdad, and an ambulance car was in readiness in the aerodrome when the pilot landed, having flown the 260 miles in three and a half hours. It is obvious after reading Wing Commander Treadgold's article, how much trouble and discomfort to the patient would have been saved had the modified Neill Robertson stretcher, which he describes, been available.

Even as it was, this patient stood the journey well, having slept most of the way.

Here again it is interesting to contrast this flight with the evacuation by road of the rest of the wounded in Abu Kemal. There was a journey by Ford ambulance cars of 220 miles over the worst road in Mesopotamia to Ramadie post hospital, and from there a further twenty-five miles journey to railhead at Feloudja. To add to the troubles over this route were the frequent attacks on convoys by raiding bands of Arabs.

It is reasonable to suppose that such trials and tribulations of casualties in present-day Iraq have been removed entirely by the advent of the huge troop-carrying aeroplanes, where, in the words of the poet in *Punch* :—

"In Iraq's sheik infested spaces
Bold Bedouins, camped by green oasis,
Hear through the insect haunted night
The droning murmur of their flight."

Editorial.

HYPERPIESIS.

Hyperpiesis was the subject of a discussion at the Royal Society of Medicine on January 25. The discussion was opened by Lord Dawson, who was followed by Professor T. R. Frazer and about a dozen other Fellows of the Society. This is evidence of the interest that is now centering round this condition, when it is remembered that it was the subject of discussion so recently as the last Annual Meeting of the British Medical Association.

Since the day that Clifford Allbutt added the term hyperpiesis to our dictionary of medical terms, much has been written and a considerable amount of experimental and clinical observation has been carried out; but our conceptions as to the origin of the condition are still crude, and little real progress has been made since Gull and Sutton drew attention to the importance of high blood-pressure of purely arterial origin as opposed to that of renal origin.

Starling has contributed valuable observations from the physiological standpoint and insists that the causation of hyperpiesia must be first sought in the vasomotor centre. His experiments showed that the vasomotor centre is acutely sensitive to the slightest alteration of the blood-flow through it, the slightest decrease bringing about vaso-constriction and a rise of blood-pressure.

The relation of arterio-sclerosis to hyperpiesia (a condition of disease, as opposed to hyperpiesis—a condition of persistent hypertension) has been discussed by Geoffrey Evans, who describes the morbid anatomy of hyperpiesia as consisting essentially of hypertrophy of the heart combined with a "diffuse hyperplastic sclerosis" of the arteries and arterioles. The essential histological change is a reaction of the endothelium of the blood-vessels and thickening of the intima, which is regarded as evidence of a circulating toxin. This change in structure (arterio-sclerosis) he regards as coincident with a change in function (hyperpiesis) and there is no necessity to consider one as the outcome of the other, that in fact they may well be the effects, possibly simultaneous, of a common pathogenic agent.

A further plea for a toxic origin of hyperpiesis has been put forward by Batty Shaw, who has shown that a condition of uræmia may supervene in cases of hyperpiesia without the kidneys being diseased. This observation is further proof, of what has been long realized, that urea in the blood is not the cause of uræmia but some other circulating toxin or toxins.

A very attractive explanation of the mechanism of the production of hyperpiesis is put forward by Starling, who points out the susceptibility of

capillaries to chemical influences which alter their permeability, e.g., the production of wheals on the skin as the result of ingestion of certain animal poisons. The capillaries of the brain run in pericapillary lymphatics and any increased exudation through the capillaries would cause a rise of pressure in the lymphatic and a corresponding narrowing of the lumen of the capillary. He has suggested that such a condition of altered capillary wall, by lessening the circulation to the vasomotor centre, is responsible for the high arterial pressure which is the invariable concomitant of certain toxic conditions, such as uræmia and the toxæmia of pregnancy; a suggestion which fits in with the post-mortem appearance of the brain in such cases.

The recent observations recorded by Lord Dawson on the blood-pressures of children open out another field of investigation and provide a stimulus for further research into the causes of hyperpiesis. Lord Dawson is with Starling in insisting on the fundamental importance of the vasomotor centre in the production of hyperpiesis, but as the result of his observations in children he suggests that even in childhood there is evidence that certain individuals have an over-responsive nervous system which reacts abnormally on the vasomotor centre. In other words, the link between the higher nerve centres and the vasomotor centres is too close. Such individuals under physical or psychical stress are liable to a transient hyperpiesis. There is evidence that this over-responsiveness is sometimes familial. The number of cases observed renders it possible to exclude sepsis or infection as a causative factor in these youthful cases, though Strickland Goodall's indictment of scarlet fever must be borne in mind.

Lord Dawson does not suggest that every child who shows an over-responsiveness of the vasomotor centre to stimulus will become a hyperpietic, but in some cases the reaction may be so marked as to justify classifying the child as a potential hyperpietic. His example of such a case is a boy whose blood-pressure resting was 135/70, after running up a flight of stairs 170/85, and the sphygmomanometer reading still remained high twenty minutes after exercise instead of returning to pre-exercise figures in three to five miuutes, as is normally the case. He argues that such a subject has the makings of a permanent hyperpietic, and that under the influence of repeated stimuli the resting blood-pressure gradually acquires a higher level. With such a conception, due consideration must be given in each individual case to the temperament, occupation, social environment, physical habit and familial tendencies, and, as life proceeds, to the effect of anxiety and worry and the metabolic disturbances of middle life. Therefore, a functional tendency to supertension in youth may develop in later life into hyperpiesia.

Very much the same line of argument was put forward by Dr. Ryle, whose experience in fifty cases of hyperpiesis was that sixty-two per cent were of the hypersthenic type, robust, healthy, stout and tending to the

plethoric habit, with hypertonic stomachs, hyperchlorhydria and abundant good muscular tone. These people had good appetites and capacity for work above the average. He suggested that the effects of stimuli of over-eating, of over-work and worry, would in persons of this type eventually tend to a permanent raising of the blood-pressure and was of opinion that infections and toxins could be safely ruled out as causative factors. Sixteen per cent of his series were of poor physique and four per cent of lean and nervous type. In both these groups infections obviously played an important part in the causation of the hyperpiesis, and the menopause was the determining factor in some.

In cases occurring in adolescence and about the menopause disturbances of the internal secretions would appear to play a part, but the difficulty in accepting an infective or toxic theory has been, and is, that most of these toxins have a depressor rather than a pressor effect.

Much evidence has therefore been brought forward to show that certain individuals have a physiological tendency to the development of high blood-pressure, and while the recognition of such a tendency may be of great service in suggesting the adoption of precautionary measures, still it can hardly be said to provide the solution of the problem. There must be some process of faulty metabolism, however produced, and it is to bio chemistry that one naturally turns for an explanation. In this respect the observations made by Dr. Ellis on the altered relation of free acid to ammonia-combined acid in the urine of different types of this condition are of interest.

The situation, therefore, is well indicated by Professor Frazer's plea for a more intensive study of this condition. He pleaded for a thorough investigation into the origin of each case, particularly in its early stage, for a more extended use of the sphygmomanometer, and emphasized the importance of observance of the diastolic pressure as a guide to the peripheral resistance.

Hyperpiesis may not be generally recognized as a condition to be reckoned with in the Services, but that it must be is undoubted. The stress and strain, physical and mental, of active service has left a legacy of high blood-pressure in not a few cases. These cases, all too frequently, come to be recognized only when symptoms of renal or cerebral involvement have become evident and it is too late for treatment. Treatment consists essentially in removing the patient from an environment in which he is over-reactive, and to be effective must be carried out in the early stages of the condition, and this involves early diagnosis.

Army medical officers have great opportunities of observing the earliest signs of disease, and in hyperpiesis they have the means for diagnosis to hand in the sphygmomanometer. It is hoped, therefore, that Professor Frazer's plea for early and thorough investigation into the origin of each case will be borne in mind.

Clinical and other Notes.

TERATOID CYST ASSOCIATED WITH PROLAPSE OF THE UTERUS.

By Captain D. C. BOWIE,
Royal Army Medical Corps.

The following case occurred in the Civil Hospital, El Obeid, Sudan.

The patient was an Arab woman, aged about 45, admitted on account of a complete prolapse of the uterus.

The Arabs in this region practise complete circumcision of their women i.e., the labia are completely removed when the girls are quite small and the legs are tied together. Cross-union occurs, leaving in the virgin a vaginal orifice which will sometimes hardly admit a lead pencil. This orifice then has often to be cut open before marriage and also at the birth of each child. The result, of course, is that dense scar tissue surrounds the vaginal opening.

In this case there was a complete prolapse and the bladder and vagina were infected, but no definite history could be obtained as to the duration of the condition. Rather to the left of the middle line low down in the abdomen could be felt an elastic swelling the nature of which it was impossible to determine.

On opening the abdomen in the middle line a tumour was found lying behind and on the inner side of the iliac colon and pushing the colon forwards and outwards. The tumour, which was about the size of a small coconut, was sagging down into the pelvis and was readily removed by incising its peritoneal covering, when it was shelled out intact. It had evidently originated between the peritoneal layers of the mesentery of the colon.

The uterus was then brought up and the round ligaments shortened, to prevent any tendency to recurrence of the prolapse. The result was very satisfactory and the woman soon went out well. The tumour proved to be a teratoid cyst containing grease and hair only.

Mr. A. E. Webb-Johnson reported a case in the *British Medical Journal* of March 28, 1925, where an embryoma of the omentum gave rise to symptoms suggestive of ureteral calculus. The tumour in his case was of "mixed formation, part of it being cystic and part of it hard and calcified. The cystic part contained a mass of hair and sebaceous matter. The tumour was evidently a small embryoma."

Sir John Bland-Sutton, at page 514 of his "Tumours, Innocent and

Malignant," says on the subject of teratomas of the mesentery: "Many cases have been reported in which cysts containing pilose skin and occasionally teeth have been found on the omentum and the serous covering of the intestine. In some instances these cysts are due to the rupture of an ovarian dermoid, and some of the cells scattered about the abdominal cavity have engrafted themselves on the peritoneum and formed independent cysts. Quite apart from cysts arising in this way teratoid cysts do arise independently between the layers of the mesentery, the omentum and the folds of peritoneum connected with the cæcum, colon and rectum. Most of the reported cases occurred in children and adolescents, especially females. As a rule, the cystic contents are grease and hair but some are more complex and contain bone, cartilage, muscular and nerve-tissue.

"It is impossible to recognize the nature of such cysts clinically. They seem to remain latent for a variable period and then with dramatic suddenness cause acute abdominal pain simulating peritonitis or intestinal obstruction. Some never cause trouble, and are found accidentally at a post-mortem examination."

CASES OF MUSHROOM POISONING IN INDIA.

By Captain A. E. S. PRINGLE-PATTERSON.
Royal Army Medical Corps.

The following notes may be of interest:—

At 11.40 p.m. a message was received that Colonel and Mrs. M. had been taken ill after dinner, presumably from poisoning. On seeing them it was stated that illness had come on from fifteen to thirty minutes after dinner at which the savoury had been mushrooms on toast. Two other diners, who had not eaten this, were quite well and no other item of food or drink seemed in any way suspicious. In each case the patient complained of a feeling of dizziness and that this sensation would recur in waves, at short intervals, and was worse on lying or sitting but less on standing or walking.

Closing the eyes very much increased the "swimmy" sensation and they felt light-headed, both likening the sensation to "going under an anæsthetic." Mrs. M. complained of a slight feeling of constriction of the throat but there was no vomiting, pain, diarrhœa, burning or dryness of the mouth or any other physical sensation. Both, however, said that when they closed their eyes they saw lights and the suggestion of horrid visions as in nightmare. Pulse in each case between 80 and 90 regular and full. Pupils equal and normal, and patients talking perfectly and sensibly. Both had vomited slightly. In each case an emetic was administered with good result. About half an hour after the emetic had acted in the case of Mrs. M., it was noted that her pupils were widely dilated but

no other change. The dizzy sensations were still present but the intervals were becoming longer. Colonel M. now became somewhat boisterous, laughing and giggling, but there were no corresponding symptoms in the case of Mrs. M. Colonel M. quickly became quiet, and both were put to bed, the dizzy sensations having become much less. Each was given a dose of castor oil in brandy and ordered to remain quiet, which, with an occasional chuckle from Colonel M., they did.

Meantime, Captain P., the other member of the party who had eaten mushrooms, sent word that he was not well and on being visited gave an almost exactly similar account of sensations and visions with a slight stiffness of jaw and neck. He stated he felt as if he had been drinking.

He, like Colonel M., after his emetic had acted, roared with laughter. There was nothing to note in his pupils nor did they change after the emetic and his pulse was regular and full as in the other cases.

The patients were watched until it seemed fairly certain that no other symptoms were likely to develop although none of them could sleep, each saying that although comfortable, "their brains were too active."

Next day they appeared quite recovered, though tired and feeling "washed out."

The only note one might add is that Mrs. M. had taken no alcohol and she had no giggling nor were her visions so marked, but her pupils dilated. Captain P. had a vermouth and a port, while Colonel M. had in addition to vermouth and port, a whisky and soda, and his mental condition was most affected, although whether the alcohol increased the amount of toxin absorbed or the toxin vastly increased the effect of the alcohol, it is difficult to say.

As all the mushrooms were eaten it was not possible to find which, if any, poisonous fungus had been inadvertently included, but everything pointed to this as being the cause of the condition, which, taken on the whole, was not unlike that produced by alcohol.

THE EFFECTS OF A STING BY A POISONOUS CŒLENTERATE.

By Major E. B. ALLNUTT, M.C.
Royal Army Medical Corps.
D.A.D.H. & P., Bermuda Command.

The majority of jelly-fish are harmless, but the following exception is an example of the unpleasant and even serious effects that may be produced by the sting of a certain species.

On September 30, 1925, Private W., of the Second Battalion, the Green Howards, was removed from the sea at the Garrison bathing place in a

practically collapsed condition. He was at once taken to the Military Hospital, Prospect, where I saw him a few minutes later.

He appeared to be in a condition of mental excitement and was writhing about on the bed, complaining of agonizing pain in the lumbar region, and of increasing difficulty in breathing, combined with a feeling of impending suffocation.

The head was retracted and the body tense, with all the muscles of the trunk and limbs in a condition of rigidity.

He was obviously suffering from dyspnœa, and during acute attacks of pain tore his bed clothes into pieces in his spasmodic struggles.

The face was flushed, temperature normal, and pulse-rate of 100, volume and tension good.

Over the whole abdomen, thighs and flexor surfaces of his arms, were numbers of radiating wheals of hæmorrhagic appearance, resembling those resulting from the strokes of a thonged lash.

He continued in this condition for over an hour, the pain and rigidity then became intermittent in character, and the dyspnœa markedly decreased.

When able to speak coherently, he stated that on diving into deep water he found himself entangled with a large purple spherical-shaped fish, the thread-like filaments of which he was unable to detach from his arms and body.

He was just able to struggle to the diving board, and on being brought ashore, his comrades picked off these strands, and were themselves stung in so doing, but with only slight local symptoms resulting.

He remembers very little of the next hour or more except the acute pain in the back and the feeling of suffocation. Within three hours of the sting he was breathing normally and both dyspnœa and lumbar pain had disappeared, but he complained of some pain and burning sensations limited to the wheals on the abdomen and limbs. He was discharged from hospital the next day, and no painful sensations remained after two or three days, though the wheals were discernible and showed a pigmented appearance.

As regards treatment, a hypodermic injection of morphine and atropin alone gave relief. Hot bottles were applied to lumbar region. Locally an alkaline (ammonia) solution, followed by carron oil, applied to the wheals greatly eased the pain and burning sensation. Belladonna similarly applied was not so efficacious. As soon as the patient could be left, I visited the bathing place in the hope of identifying the fish concerned in this case, but the high sea running at the time had removed all traces of it.

From the description given by the patient and his comrades, there is no doubt that the sting was inflicted by a species of large jelly-fish.

The mushroom-shaped purple jelly-fish which infests these waters in the hot season appears to belong to the genus *Lobonema*, and stings from this jelly-fish have been the frequent experience of most of us during the summer.

With the exception of the case of Private W., there has been no other instance of general symptoms resulting from stings of this nature. In all the other cases the wheals caused by contact with the filaments of the *Lobonema* have invariably shown more of an urticarial than a petechial appearance, and have been of an evanescent nature, disappearing within a few hours of the application of a weak alkaline lotion.

In the case of Private W., we may have been dealing with a hypersensitive individual, who exhibits an idiosyncrasy to such stings, i.e., a condition of allergy.

With no previous history of jelly-fish sting (the patient having just arrived from England), the general reaction in this case cannot be grouped with anaphylactic phenomena.

From the scanty information obtained locally, it would appear more probable that in Private W.'s case the symptoms both local and general were due to contact with the thread-cells carried on the thirty-foot filaments of the genus *Physalia*, or "Portuguese man-o'-war."

This animal when below the waves with its ventral surface uppermost, may be easily mistaken for a *Lobonema;* it consists of a pearly bluish purple, crested bladder-like floating body, from which the numerous long filaments stretch out like a flail through as much as twenty or thirty feet of surrounding water.

Severe symptoms, both local and respiratory, have been recorded as occurring after extensive contact with the *Physalia*, and painful stings have also been inflicted on those who have handled the filaments when removing the latter from persons entangled in them.

As no similar severe results from stings by *Cœlenterates* have been previously recorded in this Garrison, these notes may be considered to be of general interest.

Travel.

A FEW STATIONS IN INDIA.

By Mrs. H. V. BAGSHAWE.

PART I.

As the majority of officers and their wives seem to look upon their tour in India as a penance instead of a pleasure, it may be of interest to those coming out for the first time to hear about a very small portion of the country from one who sees all its good points and many advantages, and finds very few disadvantages.

As I have spent most of my life in the Colonies, I left England eighteen months ago delighted to say good-bye to the dull skies and cold climate and terribly high cost of living—our last station was London, where I suppose it is worse than anywhere else. My great desire had always been to come to India, and now that I am here I must say it has come up to my expectations. My husband, too, who had done a previous tour fifteen years ago was delighted to return, and finds life out here very little altered, except of course for the rise of prices.

We sailed from Southampton early in November, 1924, on H.M.T. "Hecuba," arriving in Bombay on December 1.

I was determined to catch my first glimpse of India at sunrise, so I was up on deck at 4 a.m., and was well rewarded. Never shall I forget it, the ever-changing opalescent colours, from the palest mauves and blues to fiery reds and golds, as the sun rose over the tops of the western ghats on the eastern side of the harbour, Bombay being on the other side wreathed in the mists of dawn, her spires and domes rising up like fairy palaces out of a bluey-green lagoon.

We were tied up alongside the Alexandra Dock by 8 a.m., when our orders were brought aboard and we found ourselves posted to Jullunder, a small station in the Punjaub, about 100 miles from Lahore.

As we could obtain no information about the place from anyone on board, or at the embarkation office, we decided to stay two days in Bombay while we wired on for information regarding accommodation for ourselves and family, consisting of three children and a governess.

On receiving a satisfactory reply we left Bombay one day at noon, arriving at Jullunder at dawn, forty-one hours later. We were met by a brother officer, who had very kindly made arrangements to put us up at his own bungalow for a few days until we moved into our own. The Dak bungalow at Jullunder is very primitive, and, being on the edge of the bazaar, most unsuitable for children.

There were luckily a few empty bungalows in the cantonment, so it did not take us long to select one, choose our furniture on hire from the bazaar, buy crockery, glass, lamps, and cooking utensils, engage servants, and move in—this was accomplished in under three days; not a bad effort I think in a country where time is supposed to be no object. Jullunder is a very pretty little cantonment, situated about five miles from the city, all the roads are broad and shady, being planted with big leafy trees. Most houses have large compounds, with pretty gardens, vegetables, fruit and flowers growing in profusion, hence the place being sometimes very aptly called "The Garden of the Punjaub." It is an extraordinarily healthy station, the climate during the cold weather months being really cold and bracing, plentiful rain falling from December to March—during these months it is quite cold enough for thick winter clothes, plenty of bedding and roaring fires at night. There is practically no sickness, even in the hot weather, and it is almost free of malaria, last year's returns showing one case amongst the British troops.

The weather begins to warm up in March, by May 1 all the women and children have gone to the Hills. Jullunder as the crow flies is only about fifty miles from the Dalhousie Hills, but it is a long roundabout journey of nearly eighteen hours by rail and car.

The British Station Hospital is situated about a mile out of cantonments. It has fifty to a hundred beds and a staff of four M.O's. Not far from the hospital are the British Infantry Barracks.

Jullunder is the headquarters of a Brigade area, the garrison consisting of one battalion British infantry, one Native infantry, one Depot, or training battalion, Dogra Regiment, one battery of artillery and one squadron of cavalry. It is, I should think, quite one of the cheapest stations in India, certainly the cheapest we have struck so far. After four years' housekeeping in London it fairly made me gasp.

There is practically nothing to see in and around Jullunder of any historical interest; those who had cars sometimes went out to play tennis and dine with the Maharajah of Kapurthala at his palace fifteen miles away. After four months in Jullunder we left for Dalhousie, where my husband was lucky enough to be posted for the hot weather. We left Jullunder one evening at 5 p.m., arriving at Pathancote (via Amritsar) the following morning at 6 a.m., from there we had a fifty-two mile motor drive up to Dalhousie.

The road for the first six miles runs along the flat, then turns up into the hills, the country on both sides is very picturesque, the hillsides being thickly covered with trees of every description. In April the snow was still lying on the distant heights in Kashmere and in the clear morning air looked very beautiful. We reached Dunera, halfway, about 9 a.m., where we had an hour to wait, as owing to the narrowness and dangers of the road the traffic is controlled and only allowed up and down at a given time and has to cross at Dunera. While we waited we had break-

fast at the Dak bungalow, which was just as well, as owing to a breakdown later on we reached our destination four hours late.

Immediately above Dunera one can see the little Goorkha station of Bahklo perched on an isolated mountain top, there is only a mule track up from the main road about three miles below.

When one reaches the forty-fourth milestone the road turns into the valley of Banikhet, where there is a small maidan to which the officers, troops and residents of Dalhoosie come to play football, cricket and polo. After leaving Banikhet the road winds up the mountain side leaving the barracks of Mandkote on the left, and then passes through the second block known as Ticca, these two separate lots housing two half battalions. A little beyond this the road runs through Balun, where the garrison church, bakeries, I.A.S.C. depot, bazaar and hospital are situated and is known as cantonments. Dalhousie itself is about a 1,000 feet higher and may be reached by a steep short-cut of a mile straight up the Khud, while the motor road winds round the other side of the hill for about three miles. The hillsides are all covered with the evergreen Himalayan oak and flaming deep-red rhododendrons, the undergrowth in most places being a mass of ferns and moss.

Dalhousie proper is situated on three hills, Bakrota (8,000 feet), Terah (6,400 feet) and Poetryn (6,000 feet). Bakrota is a good three miles from Poetryn and is mostly inhabited by rich natives; Terah is also residential; whilst Poetryn has the bazaar, churches, convent and Headquarters Lahore District Offices situated on it.

We were lucky enough to obtain a charming little bungalow on Terah quite near the club and bazaar and nearest by far to the B.S.H., but even then it meant a tremendous climb for my husband up and down every day.

The hospital is beautifully situated on a spur running out into the valley of the Ravi and Bathri with a magnificent view all round. It has about a hundred beds and a staff of four medical officers, nursing sisters and orderlies. The climate of Dalhousie is extraordinarily bracing and fresh, never getting very hot. I don't think there was a night in the seven months I was up there that I didn't need an eiderdown. One great disadvantage is the horde of sandflies and mosquitoes that annoy one in May and June before the rains break. The monsoon wasn't half as bad as I expected, most days one could get out for a walk or game of tennis, but the continual mist and damp was most trying, as one could not keep it out of the house, so one found all one's things getting damp and mouldy in spite of continual airing in front of large fires; the only things to keep it out were large tin-lined trunks.

Eighteen miles from Dalhousie is the State of Chamba, a favourite week-end trip, and where many people go to get big game shooting, such as bear, panther, antelope, etc. There is quite good rough shooting to be had round Dalhousie, pheasant, jungle fowl, chicor and hares, and, for those who collect, many specimens of beautiful butterflies and moths.

The cost of living up there I found very little different from the plains, we could always obtain large supplies of beautiful fresh vegetables and fruit, the latter coming from Kulu, some fifty miles away—peaches, William pears, English apples, apricots and cherries in profusion, so that one could do without the supplies that I believe are often so necessary in the hills. After seven months in Dalhousie my husband was posted to the B.S.H. New Cantonments, Delhi. We were delighted at the thought of going to the capital of India, but New Cantonments is by no means Delhi, being ten miles out; it is new in every sense of the word, a few bungalows dumped in the middle of nowhere. No shops, no churches, no bazaar, in fact absolutely nothing. The B.S.H. is a most imposing-looking building, its establishment being two medical officers, nursing sisters, etc. And a complement of about 100 beds, but it is so big it would take 500.

Delhi is the Headquarters of the Brigade area and the garrison normally consists of one British infantry battalion, two Native infantry, one regiment of cavalry, one battery of artillery and one company of armoured cars. During the cold weather months the British infantry and one Native infantry go into camp at Kingsway, three miles the other side of Delhi, to guard the Viceroy, whilst the gunners and armoured cars are stationed in the old fort inside the city, so that the population of New Cantonments dwindles considerably, and it is often difficult to get a game of bridge or tennis. Later on, in 1926-27, when the Viceroy lives in the new Viceregal Lodge in the City of Raisina, the two battalions stationed at Kingsway will return to Cantonments.

All bungalows in New Cantonments are owned by Government and consequently the rents are very high, but they are big and confortable and have water laid on and fans and electric light. Nearly everyone has a car and spend all their spare time going in and out of Delhi for shopping and amusements. We managed to exist without one, though I must own it was a little awkward at times. Last January, the big Eastern Command manœuvres brought 30,000 troops into camp at New Cantonments. Spectators had the chance of seeing a very fine demonstration of an artillery barrage (long distance) also a review of all troops by the Viceroy and the late Commander-in-Chief, Lord Rawlinson.

The cold weather in Delhi is cold and bracing and lasts from the end of November to the end of February, but unlike Jullunder no rain fell during the six months I was there. The thermometer rises pretty high in June before the monsoon breaks, and from then onwards the station is not very healthy, malaria being fairly bad. Although we had no car, owing to the kindness of friends I was able to see all the "sights" of Delhi, both ancient and modern. The present city stands within the old walls built by Shah Jehan in 1648, and is situated on the right bank of the Jumna. The Citadel or Fort stands on the eastern side of the city on the immediate banks of the river, its walls forming the eastern defences. There is a small British garrison in the fort of one battery of artillery, one armoured car

company and a company of British Infantry, also a ten-bedded detention hospital with a medical officer in charge. The Fort in the hot weather is most unhealthy, especially in the later months when the malaria is bad. It would take many pages to describe the wonders and beauties of the old buildings inside the Citadel that were built by Shah Jehan, they are mostly of white marble inlaid with semi-precious stones, few of which now remain, but owing to the foresight of the late Lord Curzon a Bill was brought into force in 1905 protecting and preserving all ancient monuments, so that ever since then all these beautiful buildings have been looked after and the grounds surrounding them cared for; in some places the frescoes and decorations have been restored to show visitors what these buildings were like in the old days.

Immediately opposite the entrance to the Fort known as the Lahore Gate is that famous bazaar Chandi Chowk; here arts and crafts of every description may be had, ivory carvings, paintings, embroideries, silks, pottery and jewellery. A morning spent in Chandi Chowk is well worth the dusts and smells one encounters there.

At the bottom of this famous street stands the Hindu Jain Temple, unique of its kind, I believe, but I never visited it.

Not far off is the Mahommedan Jumma Musjid or Great Mosque, erected by Shah Jehan in 1644, built of red sandstone on a rocky eminence overlooking the fort and river. An enormous flight of steps leads up to the main entrance, inside is a huge courtyard paved in marble and marked off in spaces, each to accommodate a worshipper, at the western end stands a huge dome flanked by two minars. Visitors are shown with great pride a sandal worn by the Prophet, his footprint in stone and, most precious of all, a hair from his beard.

Leaving the city by the north or Kashmere Gate one may see the breach there made by the victorious British troops in 1857, and further on one comes to the famous Ridge on which stands a red sandstone memorial to those who fell in Delhi during the Mutiny.

To the south-west in the centre of the new city stands the old observatory of Jantar Mantar built by Rai Singh in 1710. A group of weird scientific buildings with a colossal sundial in the centre some sixty feet high; one may ascend this up a flight of ninety-seven steps where one obtains a fine view of the new city.

About a mile out of Delhi on the Agra road stands a heap of ruins known as the Ferozo Shah Kotal, in the centre of which is a tall marble pillar called the Asokha pillar and dating from 250 B.C., brought to its present position in 1351 A.D. by Firoz Shah.

A little further on one comes to the Puranakila or old fort, date of building unknown, but occupied at different periods by Sher Shah and Humayun. Two miles beyond this is the tomb of Humayun, father of the famous Akbar, a large red sandstone edifice in the usual pattern of Moghul tombs. It stands in palatial grounds and is surrounded for many miles by

a veritable graveyard, so numerous are the tombs in this area; the next biggest is Safdar Yang, Prime Minister to Ahmad Shah. Beyond these tombs, eleven miles away, is the minar or tower of Kutb Ala-ud-Din. It stands in the ruins of his old city and rises to a height of 400 feet. It is described in the guide-books as the seventh wonder of India, and is certainly well worth a visit. Near here is a wonderful old Baoli or well of great depth, three sides of which are enclosed by tiers of stone corridors, whilst the fourth has a long flight of steps down to the water.

A few miles to the south-east of the Kutb stand the fort and ruins of the old city, built by Tuglaq Shah in 1323 and since known as Tuglaqabad; the walls are over five miles in circumference and some forty feet high.

I have only mentioned a few of the most interesting monuments; they are really innumerable to those who care for sight-seeing. I think to see Delhi is to see one of the most interesting sights in India.

PART II

During our time in Delhi I paid a visit to Agra and found it most delightful and picturesque and even more interesting than Delhi from a historical point of view.

It is a small cantonment but most attractive; big shady trees and pretty gardens, most of the bungalows have thatched roofs, there is an exceptionally nice club, and out by the famous Taj a small golf course. The B.S.H. is situated not far from the station and has three M.O.'s. I believe it is a cheap station; the friends with whom I was staying had previously been stationed at New Cantonments, Delhi, and said they found a vast difference all round in prices at Agra.

My first excursion sight-seeing was to visit the Taj Mahal at midnight on the occasion of a full moon. I am sorry to say I was sadly disappointed; one is led to expect so much. It was certainly a very pretty sight; but reminded me too much of one of Arthur Collins's wonderful productions at Drury Lane; it only wanted a scantily-clad Eastern chorus to complete the effect. A further visit in daylight and a climb to the top of one of the four flanking minars did not alter my impression, though I must own I greatly admired the craftsmanship of inlay and carving.

The following day I went across the River Jumna, on the banks of which the Taj stands, to see the tomb of Itmad-ud-Daulah, the grandfather of the beautiful Mumtaz-i-Mahal. A little gem of a building, quite different from the usual type of mausoleum built by the Moghuls.

Another afternoon I spent in the fort four hours of unending interest, as I was lucky enough to have a friend to take me round; he knew every nook and cranny. I saw the military and archæological section and many interesting things that the ordinary tripper is not shown; the fort at Agra is much bigger and far more interesting than that at Delhi. It was built

by the great Akbar in 1565, and is still in an almost perfect state of preservation.

Twenty-six miles south-west of Agra is the deserted city of Fatepur Sikri; it was only occupied for a short time by Akbar, who then decided to return to Agra. The walls of the city are six miles in circumference, the palaces and Jumma Masjid are situated on the crest of a low hill in the south-west corner of the city, many of the buildings are still in a state of good repair, the gem of all being the tomb of the Saint who lived there in a cave previous to the building of the city. The tomb itself is inlaid with onyx, ebony and mother-of-pearl, and is adorned with a pillared canopy in the same work. I spent three hours there, and only saw about half there is to be seen.

Five miles north of the Delhi road is the tomb of Akbar; it differs from all others—the actual body is buried under ground, but the cenotaph of white marble is five stories up in a marble-paved courtyard open to the sky.

Agra is noted for its alabaster and marble carving; many fascinating works of art are to be had in the bazaars; the biggest trade is, I think, in miniatures of the Taj in alabaster, sold to American tourists in hundreds. Altogether I thought Agra a delightful station, and envy those lucky enough to be stationed there.

Shortly after my trip to Agra I went over to Meerut, forty miles north of Delhi, and the headquarters of the United Province District. A big cantonment with a large garrison. The B.S.H. has a large staff and is well equipped in every way. Meerut seems a very popular station. I don't think I have come across anyone who has been stationed there who didn't like it. There is plenty to amuse one, races, golf, tennis, shooting and pig-sticking. It is also a very pretty cantonment with good bungalows, and not outrageously expensive. At the end of April the weather began to warm up, so I had to take my family to the hills. Our destination was Wildflower Hall Hotel, Mahasu, seven miles out of Simla. We left Delhi one night at 9 p.m. and reached Kalka the next morning at 6 o'clock, changing there into the mountain railway, and arriving at Simla six hours later. I was very disappointed with the journey up, the hills are so bare and brown, a great contrast to the journey up to Dalhousie. One passes the hill stations of Kasauli, where there is a Pasteur Institute, Dagshai, Sabatho and Solon. The engineering of the railway is a wonderful piece of work, sometimes one looks down on three or four terraces of the line, having zigzagged slowly backwards and forwards up the side of the mountain. After passing through the tunnel of Tari Devi one comes into full view of Simla, and I don't think I have ever seen an uglier one; it is a very scattered station, being stretched along various hill tops, the highest of which is Jakko; even at a distance all the buildings look most ramshackle and dilapidated, and appear worse on closer inspection.

Simla is assuming the proportions of a city, besides the native bazaars there are many first-class European shops of every description. On outlying hills are residential suburbs.

I cannot say I was greatly attracted by Simla, it seemed hot and dusty and overcrowded. Mahasu, where I was staying, is 8,500 feet; fifteen hundred feet higher than Simla, and situated in a thick pine forest. The original house was built by the late Lord Kitchener as his week-end house and residence, and a more delightful spot would be difficult to find. It stands just off the Great Hindustan-Tibet road, and commands a magnificent view of the snows to the north, and Kasauli and the plains to the south. Simla itself is, I believe, most frightfully expensive, the cost of living being nearly 50 per cent. more than anywhere else in India. It does not seem very healthy either, as one often hears of epidemics and illness, and the air is certainly nothing like as bracing and fresh as that of Dalhousie. Before ending this article I will add a few notes which I hope may be useful to newcomers to the country. I should have been glad of the information myself, and perhaps it may help very slightly in making them see the good points and appreciate the country as much as I have.

Bombay.—Hotels: The Taj, Grand and Ballard Pier. The Grand is very clean and comfortable and not far from the docks.

On arrival in Bombay wire on to station to know if any accommodation is available, as in most out-stations there are no hotels or dak bungalows.

Have your bedding, roll of blankets, pillows, &c., ready, as none are supplied on the Indian railways, also towels and all toilet requisites that are necessary for the journey.

A restaurant car is attached to all mail trains, but with children it is a good tip to get the Army and Navy Stores to put one up a case or hamper of food, so doing away with the long trek down the train to the dining car, and the unsatisfactory food obtained there; bottles of boiled water for the journey are essential for children, as it is quite unsafe to ask for it at any of the stations *en route.*

As one never knows to what part of India one may be posted, it is advisable to have both warm and thin clothing handy, as if going north in the cold weather twenty-nine hours out of Bombay the warm clothing is urgently required.

It is advisable to travel with a servant, but if possible do not engage a Bombay man, as they are very unreliable and mostly dishonest; a good tip is to write out to a friend up country to engage one to meet you at Bombay.

Servants up country are on the whole excellent; I have been very lucky with mine, and could wish for none better. Their wages are not high as they feed themselves and want no extras. Mine cost me the same as a cook and small slavey at home, who got high wages, food, washing and all sorts of extras, and were always wanting days off and afternoons off, which an Indian servant never does. A lot depends on the bearer (butler) being a good man, as he is the head servant and can control the rest and make them work well if he so chooses.

Jullunder.—No hotels. A very indifferent dak bungalow, badly furnished, and no servants.

Dalhousie.—Stiffles Hotel and Stiffles Annexe.

Delhi.—Maiden's Hotel and the Cecil, the latter strongly recommended.

Agra.—The Cecil Hotel and Laurie's Hotel, both excellent.

Meerut.—Stiffle's Hotel, very comfortable for long residence.

Simla.—The Cecil Hotel, Korstorfan's and many others, besides endless boarding houses and apartments.

Horses and Ponies.—The cost of a good polo pony or first-class hack is very high, but small ponies of 14 hands for ordinary work can be picked up for 300 to 590 rupees.

Dogs.—Many people bring out English thoroughbreds or obtain animals out here; but I think it is very risky, as the whole country teems with rabies and the risk is heavy.

Motor-cars or bicycles are essential to an M.O. for his work, the former in big stations such as Lahore, Pindi, Lucknow and others, but bikes suffice in the smaller stations; both may be purchased out here new or secondhand.

Recreation, with the exception of polo, is cheap in India, as one's ordinary subscription to the local club covers all games, one hardly ever being asked to pay more than ten to twelve rupees a month inclusive.

Firearms.—It is as well to bring out two shot guns of different bore, and a rifle, but not a ·303, as these are no longer allowed to be imported.

Luggage.—Bring as many tin-lined trunks and boxes as possible to keep out the innumerable destructive insects and the damp of the monsoon.

If possible, always take all your luggage with you per passenger train, as if sent per "goods" it is doubtful if you will see it for some weeks.

Clothing.—Both men and women should bring thick and thin clothing, as one is liable to be moved about so much. The durzi (tailor) of India is wonderful, for a few rupees he can make and copy anything. Good material from home and made up by the durzi is a great economy.

Everyone should possess a topee; excellent ones may be purchased at Port Said at half the price of those obtainable either at home or in Bombay.

Customs Duty is very nearly thirty per cent on everything; it is advisable to bring out as little real silver as possible, not only to avoid duty, but to have less to tempt the wily native, who is generally not at all interested in electroplate.

Leave is granted in the hot weather if the officer is not posted to a hill station, and once during his tour he may be granted six months' long leave.

Food in India is excellent, meat, vegetables and fruit being very cheap; ordinary groceries are expensive, but fifty per cent. may be saved by getting a large consignment once or twice a year from wholesale dealers in the big seaport towns.

All the stations in the Punjaub have Government military dairies, where first-class milk or butter is produced.

Furniture can, I think, be hired in every station in India, the only place I have heard of it not being forthcoming is Cawnpore. It is generally strong and serviceable and inexpensive.

Linen, blankets, pillows, &c., should be brought out, curtains or material for them always comes in useful in making the big and barn-like bungalows of India more comfortable and attractive.

Crockery, glass, and kitchen utensils can all be hired or purchased locally, or if a better class article is required can be ordered from Bombay or Calcutta and other big towns.

Eighteen months in four stations out here has proved to me that one can live far more cheaply in India than in England, one gets far more for one's money and it seems to go much further. For years I have kept careful and detailed accounts, which show at the end of a year we had spent far less than we ever did at home, and yet we live in complete comfort, one almost might say luxury, have bought ponies, etc., and thoroughly enjoyed ourselves, whilst at home we lived like hermits in a suburban cottage and merely existed, and yet could not make both ends meet. We both came to India prepared to enjoy our life out here, and we have, every moment of it !

Current Literature.—Surgery.

Tumours of the Testicles: The Spermatocytoma Group. Abstract from the *British Journal of Surgery,* vol. xiii, No. 50. October, 1925. By F. Gordon Bell, Edinburgh and Dunedin.

In a previous article the author dealt with the teratoid group of testicular growths; this article deals with the second relatively common group of neoplasms of the testicle—the seminiferous or germ-celled tumour called variously spermatocytoma, seminoma, round-celled sarcoma and embryonal carcinoma.

Two conceptions prevail with regard to the origin of the seminiferous cells. (1) It is generally stated that the seminiferous cells are derived from columnar germinal epithelium (mesothelium) which covers the genital ridge lying medial to the Wolffian body. (2) Beard on the other hand concluded from a study of the primitive sex cells in elasmobranchs that the genital or sex cells are formed at a much earlier phase in development—the morula stage—and migrate through the entoderm into the genital area when the cœlom is formed.

Whether the seminiferous epithelium is derived from the mesothelium of the genital ridge or migrates there from the morula the author states remains uncertain.

In the structure of the fully-developed seminiferous tubules the important point is that the cells are predominantly large and rounded with a clear protoplasm and a large deeply staining nucleus, and between the cells there is commonly observed a granular or reticular framework.

In discussing the possible pathogenesis of testicular tumours from the aspect of the various tissues of the testis, consensus of opinion derives the seminiferous cells (epithelium) from germinal epithelium (mesothelium) and in this case there is the thesis of a specialized epithelium evolved from mesothelial tissue. If malignant change supervenes it seems possible that a carcinoma may develop from this special epithelium, a sarcoma from the undifferentiated mesothelium, and from a mixture of these two tissues, or from the close interlocking of the mesothelium and subjacent mesoblast observed in the early stages of development, or from reversionary mesoblastic tendencies carcino-sarcomatous combinations might arise.

Regarding the seminiferous cells, tumour formation might assume to develop in two directions. (*a*) If the process of spermatogenesis runs wild a carcinomatous tumour composed of cells of a special type may result. Such is designated a seminoma or spermatocytoma, and is regarded by some as a common tumour of the testicle. (*b*) If by any chance the sex cells are stimulated to segment, teratomatous tumours may result; for these cells the spermatogenia are regarded as totipotent and capable of giving rise to any or all the tissues of the body.

The spermatocytoma group: the writer is convinced that a specific tumour which may be called a seminoma or a spermatocytoma exists beyond all shadow of doubt, though other authorities describe this group as embryonal carcinoma arising from a one-sided development of a teratoid tumour. Should a one-sided overgrowth take place along these lines in a teratoma and by suppression of the other elements transform the tumour into a pure or almost pure carcinoma, the histological elements might closely resemble those of the germinal tumour.

The subgroup carcino-sarcoma are essentially germinal-celled tumours, and should not be confounded with carcino-sarcomatous features sometimes seen in a teratoma. In the germinal-celled tumours the carcino-sarcomatous potentialities are inherent in the cells themselves and the connective tissue takes no part in the formation of the combined tumour. The cells of the carcino-sarcoma in most are of the epithelioid character, but sometimes are of the large round, small round, oval or coarsely spindle type so suggestive of sarcoma. In most cases a fine, granular, or reticular matrix can be seen between the cells even when these are typically epithelial, but this is also often seen between the cells of the seminiferous tubules. The blood-vessels may be of a mixed type, and metastasis spread by both the blood- and lymph-stream.

The most reasonable explanation of these characters is supplied by the mesothelial origin of the secreting elements of the testis, and it is also reasonable to conclude that these tumours are homologous and arise from the germinal cells of the seminiferous tubules.

In describing the microscopical characters the author is inclined to believe that reversionary tendencies play a large part in the so-called lympho-sarcoma of the testis.

The writer draws attention to the fact that all the germinal tumours described in his series, with one exception, came to him from a variety of sources with the diagnosis of round-celled sarcoma, and it is impossible not to assume that there must be some sound reason for such unanimity.

L. T. P.

The Technique of Extrapleural Thoracoplasty. By H. Morriston Davies. *British Journal of Surgery*, July, 1925.—The object of the operation is to produce a unilateral collapse of the chest wall in order to overcome the mechanical difficulties associated with the healing of a diseased lung. It is employed in certain cases of tuberculosis and of bronchiectasis. The essential factor of the operation is the removal of a portion of almost every rib of one side as close as possible to the transverse processes of the vertebræ.

The author gives an outline of the advances which have taken place in thoracoplasty during the last thirty-five years. He discusses in detail the technique adopted by the various authorities in regard to the anæsthetization, the number of stages in which the operation should be performed, the incision and the number of ribs to be resected.

The following is an outline of the author's technique. Before the operation the patient is encouraged to expectorate, and omnopon gr. ⅓ is given. An hour before the operation, and while the patient is still in bed, the line of the incision and the intercostal spaces are infiltrated with not more than 60 c.c. of a 1 per cent solution of novocain. Absolute alcohol is injected around the intercostal nerves. The patient is placed on the table lying on the sound side, morphia and atropin are given and light chloroform anæsthesia is induced. The incision begins at the upper border of the trapezius and runs downwards between the vertebral border of the scapula and the spines of the vertebræ at about 4 in. from the latter. The incision is carried down to the tenth or eleventh rib and then forwards to the posterior axillary line. The muscles are then divided down to the ribs. Working from below upwards the periosteum is stripped from the portion of each rib to be resected and as each is freed the lung and soft tissues retract away from it. The required amount of rib is then removed with bone forceps. If the condition of the patient is satisfactory after the removal of ribs eleven to five, the resection of ribs four to one is proceeded with at once. If unsatisfactory these four ribs are resected at a later operation. The total length of rib resected is about 125 cm. The muscles are sutured, a large drain is inserted and the incision closed.

The collapsed side of the chest has to be supported for several months until the chest wall has become fixed by new bone formation.

Post-operative troubles are generally mild considering the severity of the operation.

The after results are often wonderfully good, and sometimes cough and expectoration cease abruptly.

Of 1,025 cases reported by various surgeons during the years 1918-23 32 per cent were cured; 26 per cent improved; cases that were made worse and those who died as a result of the operation, 35 per cent; miscellaneous 7 per cent.

P. O.

Vesical Diverticula.—In the *British Journal of Surgery*, of July, 1925, Mr. Ogier Ward published an article on the clinical study of eleven cases of this condition. He makes it quite clear that septic paravesical cavities, traction pouches, and pouches that sometimes persist at the apex of the bladder owing to incomplete obliteration of the urachus are quite distinct from the diverticula or pouches which are the subject of the article.

These pouches communicate with the bladder by a single orifice. Microscopically all the coats of the bladder are represented; the mucous membrane is continuous with that lining the bladder but is not so well formed; the submucous is very thin and often shows inflammatory changes. The muscular layers are always present though varying in thickness, and sometimes form a thick ring round the sharply-defined orifice of the pouch which he says is incorrectly spoken of as the sphincter.

Diverticula may be single, or there may be two placed symmetrically, or they may be multiple. It would appear that such diverticula are rare in animals. None are reported in domestic animals, and the anatomists of the Zoological Society and the Natural History Museum have never met with the condition in their investigations, although one case has been reported in a Bengal monkey by Legueu and Papin.

It is considered by Mr. Ward that vesical diverticula may cause serious trouble to the patient, and though sometimes difficult to diagnose, they can easily be recognized if suitable methods are employed.

Frequency of Occurrence.—In one hospital 924 operations were performed for bladder conditions in ten years, and of these only twenty-seven were for removal of diverticula; consequently, he considers his eleven cases worthy of report.

Origin of the diverticula appears to be uncertain, but it is held that though they are usually found late in life, they are always due to a congenital predisposition, because they always occur at points that are developmentally weak. Another view is that they are formed from accessory ureteric buds.

In the cases of this series, eight had single or multiple diverticula, all situated where the musculature is known to be weak. Two had the openings on the posterior wall far removed from the ureters. The eleventh of the series he considers was certainly congenital. This case is fully reported and illustrated by an excellent radiogram.

It would appear that vesical diverticula are uncommon in women, which goes to prove the view generally held, that though diverticula may

be entirely congenital and appear apart from obstruction they are most frequently seen in cases where some obstruction is present, such as old stricture or enlarged prostate. Two of his cases in which there was enlarged prostate, on removal of the diverticula, residual urine was reduced and the bladder showed no further sacculation, he therefore assumes that the obstructive factor in production of these pouches is small.

Symptoms and Complications.—It would appear that the moderate-sized diverticula as a rule causes no symptoms unless they become infected, but the larger one, even before infection, may be very troublesome. He then discusses the symptoms observed in the eleven cases and notes that they are generally due to some complication.

Diagnosis.—Cystoscopy is considered the best method of diagnosis. The appearance is characteristic and is very clearly described in this article. An illustration is given of the bladder and diverticula filled with opaque fluid, which is considered the best method of estimating the size of the pouch.

Treatment.—Palliative treatment is described, but is considered unsatisfactory, and not without danger, though it may be necessary where an operation cannot be performed. In operative treatment the procedure that appears to be most satisfactory is to immobilize the full bladder without opening the peritoneum, then open the bladder and continue the dissection with the help of a finger inside. He considers the obstruction, if any, should be dealt with at the same time. Drainage is necessary.

J. S. D.

Reviews.

A Textbook of Surgical Pathology. By C. Jennings Marshall, M.D., M.S., F.R.C.S. and Alfred Piney, M.D., Ch.B., M.R.C.P., M.R.C.S. London: Edward Arnold and Co. Pp. vii + 468. Price 21s.

The aim of the joint authors of this book is to co-ordinate embryology, anatomy, pathology and clinical observation. Consequently they have not gone deeply into general pathological changes, as they assume that the reader has already acquired a knowledge of these processes from textbooks of general pathology. The first chapter, however, summarizes the most important of the changes brought about by these conditions.

The book is clearly written and admirably arranged. It appears to contain nothing that is redundant and deals fully with the whole subject of surgical pathology. There are in all 170 illustrations, chiefly photographs and photomicrographs. It appears to be of considerable value to candidates preparing for the higher examinations. M. B. H. R.

A SYNOPSIS OF MEDICINE. By H. Letheby Tidy, M.A., M.D., B.Ch., F.R.C.P. Bristol: John Wright and Son, Ltd. 1925. Pp. xv + 1000. Price 21s.

This is the fourth edition of Dr. Letheby Tidy's well-known book. Several alterations are apparent in various chapters, much having been rewritten, and the book is now fully up to date. The author states that his new chapter on Jaundice is based on the views of MacNee, and that attention has been paid to the brilliant French investigations which have been greatly neglected in the past, outside the country of their origin.

Dr. Letheby Tidy's aim is a synopsis that gives more than a mere classification of disease details. By means of short summaries and special headings the most important data are clearly indicated. At the same time he states definitely that his synopsis cannot replace a text-book, and any attempt to do so will lead to failure. He caters for the worried student and the hurried practitioner. To them he adds, "the examiner who for the purposes of a *viva voce* desires to renew for a brief period his knowledge of any of the essential details of medicine."

The new edition of Dr. Letheby Tidy's book is a work that will be found of value in the library of a military hospital. M. B. H. R.

BIOLOGICAL THERAPY. Parke, Davis and Co., 50, Beak Street, London, W. 1. Pp. 86.

We have received from Messrs. Parke, Davis and Co., the well-known firm of manufacturing chemists, an interesting little book in which the theory and practice of the use of vaccines and serums for prophylactic and therapeutic purposes is treated in a comprehensive, concise and lucid manner; there is also a description of gland therapy, phylacogen therapy and the diagnosis and treatment of protein idiopathies.

The book, which the firm offers free of charge to all qualified medical practitioners who desire a copy, is conveniently arranged in two parts of almost equal length.

Part I, to which Sir Almroth Wright has contributed an illuminating introductory chapter of twenty-three pages, deals with vaccine therapy. The various items of this part, pp. 24 to 94, have been contributed by the staff of the inoculation department of St. Mary's Hospital, to which, it is stated, a proportion of the proceeds of the sale of vaccine is applied for the upkeep of the out-patient department and the Institute of Pathology and Research.

In the introductory chapter the principles of vaccine therapy and the conditions most favourable for its successful application and its limitations are clearly defined, and a warning note is struck against the haphazard use of vaccines, whereby discredit may be brought on a method of treatment which is invaluable when applied with discrimination and scientific knowledge.

The notes on the use of vaccines in the treatment of the various

microbic infections to which they are applicable are written with all the moderation and scientific acumen that one would expect from papers emanating from the inoculation department of St. Mary's Hospital.

Part II deals with serum therapy, the principles of which are enunciated in the opening paragraphs.

The preparation of the various serums in common use is broadly outlined and detailed instructions are given for their administration.

Then follows a chapter on Phylacogen Therapy or treatment by combined filtrates of cultures of pathogenic bacteria.

There is a useful section on Gland Therapy which opens with a general survey on the history and the rationale of treatment of certain diseases by hormones, followed by recommendations for the administration of various glandular preparations in the several disorders for which they are considered appropriate.

Finally there is a chapter on Protein Sensitization and a list of group protein extracts supplied by the firm.

A full index is appended. This book combines the function of an advertising medium with that of a reliable and authoritative compendium of information concerning the theory and practice of the use of organic therapeutic substances.

We commend it to our readers.

An Introduction to the Practice of Medicine. By William Boswell, M.D.Dub., F.R.C.P.I., Professor of Pathology, Royal College of Surgeons, Ireland, Physician to the Meath Hospital, Dublin; and F. C. Purser, M.D.Dub., F.R.C.P.I., Professor of Medicine, Royal College of Surgeons, Ireland, Physician to the Richmond, Whitworth and Hardwicke Hospitals, Dublin.

In the preface to this volume the authors state that, as it has been attempted to give an adequate account of a big subject in a comparatively small book suitable for students, an incompleteness in their presentation of the subject for more mature readers is inevitable.

They go on to explain that their idea of an adequate account of medicine for students is unstinted explanation of a limited number of facts rather than a full list of facts with a limited amount of explanation.

Considered from this point of view great credit is due to the authors for the manner in which they have accomplished their task.

The book is eminently a readable one and the simple and rather dogmatic way in which the whole subject is treated should appeal to students. This is well exemplified in the first part of the chapter on infections which deals with immunity. These sections give a simple and straightforward account of a difficult subject such as is calculated to impress on the student the basic facts on which the theory of immunity is built.

On the other hand the weakness of the book (a criticism which the authors anticipate) is noticeable in the handling of the specific infections. Admittedly the selection of and the unequal emphasis laid on the individual infections is open to criticism. For instance, several pages are devoted to yellow fever, while a mere passing reference is made to infective jaundice.

Ideas as to what it is necessary for a student to learn must vary, but the accounts of some of the tropical infections are so meagre as to suggest that they might have been omitted altogether, and in some of the more important ones, such as relapsing fever and malaria, careful revision is indicated.

The above remarks apply in much the same way to the other chapters which deal with diseases by systems. Here again the initial sections dealing with clinical methods and pathology are the more satisfying.

The chapter on the heart gives an interesting account of the way in which modern conceptions of the cardiac mechanism have been arrived at, and one is pleased to see the emphasis placed on the importance of the cardiac muscle, apart from the valves, as a factor in maintaining the efficiency of the circulation.

Diseases of the nervous system are presented, as stated by the authors, in a way that is unprecedented, as an experiment in teaching and not as a classification.

The authors are to be congratulated in striking a new line by omitting all differential diagnoses and elaborate classifications, but to a more or less orthodox mind the step appears to have been too drastic, with the result that there is a lack of cohesion.

In giving details of clinical laboratory tests several important omissions are made, notably, estimation of blood-urea and fractional gastric analysis.

The statement on page 807 that "an estimation of the sugar-content of the blood must be made before and after each injection of insulin" has no substantiation in generally accepted practice. J. C. K.

AN ACCOUNT OF THE BATTLE OF LIAO-YANG. By Major-General Sir W. D. Bird, K.B.E., C.B., C.M.G., D.S.O. Aldershot: Gale and Polden, Ltd. Pp. 66. Price 3s. 6d. (net).

General Bird's small book on this great battle is intended primarily for instructional and examination purposes. The author is an acknowledged authority on military history, and in this book he deals first with the actions of the Russian army before describing those of their opponents. He presents to the reader the changing situations in the aspects in which they must have appeared to commanders during the changing phases of the battle, and his conclusions are carefully discussed in a logical and common-sense manner. The book is well written, and the author possesses a faculty for demonstrating faults and reverses of fortune as they affect the great issues at stake in modern warfare. M. B. H. R.

SCHISTOSOMIASIS VEL BILHARZIASIS. By C. G. Kay Sharp, M.D. London: John Bale, Sons and Danielsson, Ltd. Pp. iv. + 74. Price 7s. 6d.

The above is a small book which has been designed for the use of medical practitioners and educationists who may have to deal with schistosomiasis, and it has special reference to schools in Natal, where the writer is the Chief Medical Officer of the Natal Education Department. There is a foreword written by Christopherson, who places the three prophylactic means of combating the disease in order of importance, these being mass treatment by antimony tartarate, educational propaganda, and destruction of water snails in local collections of water known to be infected.

The book is good, convenient, and well edited. There is a large and extensive list of references in which this Journal is included. In his chapter on treatment the author confines himself to a general review of treatment in different parts of the world in chronological sequence, and though this may be of great value, readers would perhaps prefer to have the author's definite mode of treatment placed before them. No reference is made to the interesting communication and illustration on the mechanism of the passage of ova, contributed to the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS of December, 1920, by our Professor of Pathology.

However, there is a great deal of information in this book, and it should find many readers. M. B. H. R.

SWANZY'S HANDBOOK OF DISEASES OF THE EYE. Thirteenth Edition. By Louis Werner, M.B., F.R.C.S.I. London: H. K. Lewis and Co., Ltd. Pp. 698 and xvi, with illustrations and coloured plates. Demy 8vo. Price 21s. net.

This handbook, which has now reached its thirteenth edition, may be considered a classic of its kind.

The book is written for the student and the general practitioner. It is convenient in size and modest in price and contains everything that is required for general practice.

In the chapter on the cornea there is mention of the corneal microscope and slit lamp, but no description of the instrument is given; there is also a full account of how to remove foreign bodies from the cornea, which, if followed, would surely make for better results than one sometimes sees, but no reference is made to the corneal loupe.

There is a good chapter on the diseases of the iris and ciliary body, and the part which auto-infection from a septic focus plays in chronic iritis and rheumatism is given its proper place as a causal agent of these diseases.

Diseases of the choroid are dealt with in the chapter on the retina. The old classification of these diseases is followed, i.e., chiefly as regards the area affected. Auto-intoxication in these diseases is dismissed as a cause with the remark that "Auto-intoxication (gastro-intestinal, pyorrhœa alveolaris, etc.), may account for others." It would appear from cases one sees that this is far from an uncommon cause and deserves more recognition.

Chapter XIII on the Optic Nerve, Chapter XIV on Ocular Symptoms Liable to Accompany Focal Disease of the Brain, and Chapter XVII on the Orbital Muscles are all excellent and will surely be read by every physician or surgeon as a necessary aid to diagnosis of brain and nervous diseases.

The book is extremely well got up in a convenient size, on very good paper and of a good clear print. The illustrations are good, the coloured plates are as in previous editions.

There are a few errors which are presumably printer's errors, for instance in Chapter XVIII it states "Iritis is very common in herpes zoster ophthalmicus": this should surely read "not very common."

In anomalies of accommodation the presbyopia existing at age sixty-five is shown as 0·25, which does not agree with Donder's chart and would appear an error for $-0{\cdot}25$, and the presbyopia is shown as 4·25, which it would appear should read 4·75.

The appendix on regulations as to defects of vision which disqualify candidates for admission into the various Services is not up-to-date, at least as regards the Army. Having regard to the frequent changes that are made in these regulations it would be safer to leave them out of such a book.

The index has been considerably improved and can now be fairly depended upon.

The book can safely be recommended to students and to all engaged in general medicine and surgery as a handbook on diseases of the eye.

R. C. W.

THE HISTORY OF THE FIRST LONDON SANITARY COMPANY, R.A.M.C. (T)., a small book of a hundred or more pages in which the story of the formation of the Company and the records of various Sanitary Sections are set forth by some eleven contributors. Grimsby: Burnetts, Ltd. Price 2s. 6d.

It is a plain story of pioneer work carried on with enthusiasm and energy and often under adverse circumstances.

It also records the conception of a new administrative idea; and the story of its development to full term, delivery and birth, is simply narrated.

The birth of the First Sanitary Section in October, 1914, was such a happy event that it was quickly followed by the formation of succeeding sections till each oversea division was supplied with a sanitary offspring.

These all matured rapidly to healthy and efficient puberty under the stimulating conditions of field service.

The story of this development is here recorded and should be much prized by past members of the Company and a source of stimulation to their successors in the future.

These narratives will whet the curiosity of the historical student while alleviating the urge to self-expression of those who see their day and generation passing unrecorded.

To those of us who knew the workings of a Sanitary Section in the field this little book will recall many memories of good and unrecorded work well done, of baths, latrines and improvisations, where ingenuity was bright and labour unremitting.

The soldier on active service is much beholden to the Sanitary Section for his comfort as well as his good health. W. H. H.

BRITISH MOSQUITOES AND THEIR CONTROL. By F. W. Edwards and S. P. James. Pp. 27. Price 6d. British Museum (Natural History).

This useful brochure deals in two sections with the twenty-six species of British mosquitœs. The first part is concerned with specific identification and life-history; and the second with measures for control and protection.

The authors emphasize the necessity for accurate determination of the species it is desired to control, before active operations are undertaken. The method of attack will depend largely on the manner in which the insect passes the winter, and on whether it has one, two or several broods during the year.

The essential importance of these various peculiarities is not always realized, and Peter Bell's syncretic view of the primrose by the river's brim is not likely to bring success if adopted by the sanitarian in his attempts at mosquito control. W. P. M.

TOWARDS MORAL BANKRUPTCY. By Paul Bureau. London: Constable and Co. 1925. Pp. xvi + 546. Price 16s. net.

This book is a study of the moral—or more correctly, the immoral—conditions stated to prevail in France at the present day. It is the authorized translation of "D'Indiscipline des Mœurs," and is embellished with an introduction by Dr. Mary Scharlieb. It is a book that requires to be read carefully and systematically by the reader, so that he can follow the design of the author intelligently. M. Paul Bureau in this elaborate work commences with a plain and unvarnished tale of the social conditions in France and their evils; he states the inevitable consequences that will follow if these are not mitigated, and he gives in detail the remedies, social and legislative, that should be applied to his nation in order to bring about a return to moral discipline. He preaches a coherent sexual morality, with precepts five in number—chastity for the unmarried, the duty of marriage, the duty of conjugal fidelity, that of loyalty in conjugal relations, and the duty of continence.

The author is inspired with the need for immediate reform, and declares that France cannot go on living in the state of moral indiscipline in which the outbreak of war found her. "A nation that associates such customs of sexual indiscipline with the ordinary, everyday life of the immense majority of her young men, and which founds the conjugal life of her adults, and thus her entire social life, upon systematic sterility and conceptional or

post-conceptional abortion, is condemned to weakness, to forfeiture, to unutterable suffering, to the road of irremediable disaster."

One of the points that the author stresses is that there can be no enduring happiness and no solid welfare in nations that is not founded upon continence in the unmarried and chastity in the married, and his concluding sentence is the fine saying of Tom Mann's, "The future is for the nations that are chaste."

M. Paul Bureau's work is indeed masterly, and he does not appear to have overstated his case; he admits that the whole of his nation is not implicated, but he is convinced that his country is going fast towards Moral Bankruptcy, though the great heart of the nation still beats true. In these matters the reader who served in France during the Great War will probably form his own judgment, as he had first-hand knowledge of our gallant Allies, and the fine spirit which they displayed, together with an idea of their outlook towards various social problems. So there is little fear that Britishers will form impressions that are totally incorrect, or judge the general conduct of our neighbours across the Channel by the behaviour of a small section. The French are given to discussing their social problems in public, and to looking well ahead; and when all's said and done, in the days of the Great War we knew our France pretty well.

M. B. H. R.

Lectures on Dyspepsia. By Robert Hutchison, M.D., F.R.C.P.Lond. 1925. Edward Arnold & Co. Pp. 176. Price 5s. net.

This is a series of lectures that were delivered by Dr. Hutchison at various times, collected together in book form. They number thirteen, and the subjects comprise clinical investigation, diagnostic significance of abdominal pain, organic and functional dyspepsia, chronic diarrhœa, constipation, and the chronic abdomen. They embrace the salient features of a difficult subject, but the author states that they are designed for the use of the practitioner, and have nothing in them for the specialist.

Dr. Hutchison insists upon the importance of distinguishing functional from organic cases as early as possible, as the majority of the latter require surgical treatment. He suggests that Mr. Sherren's "Lectures on the Surgery of the Stomach and Duodenum" should be studied as supplementary to his book. He emphasizes also that functional dyspepsia in many cases is an expression of a disorder of the nervous system, and that successful and radical treatment depends upon the recognition of this fact.

This interesting book contains more than sound teaching. All the lectures are valuable, but the last—on the chronic abdomen—gives the author considerable scope for the exercise of that keen sense of humour he possesses, and is better described as priceless. "The road to chronic abdominalism is paved with operations." . . . "Dislocate the patient's mind from its perpetual revolutions round her umbilicus and set it open to

wider ambitions." . . . "Suffragettism undoubtedly was the salvation of some abdominal women, but the suffragettes are now experiencing the tragedy of fulfilled ambition, and probably many of them have relapsed."

These are some flashes of the humour that light up a subject inclined towards dullness. Dr. Hutchison, however, makes it sparkle without detracting in any way from the sound professional doctrines that he teaches.

M. B. H. R.

SYMPATHETIC TRAINING OF HORSE AND MAN. By Major T. S. Paterson, M.C. London: H. F. and G. Witherby. 1925. Pp. xi and 205. Price 12s. 6d.

This book is packed with useful information and contains innumerable hints which should be of immense value, not only to novices but also to those who already possess considerable knowledge in the matter of horse breaking and handling. We are almost entirely in accord with all the principles and advice laid down in the book; the chapters on lungeing, bitting and teaching young horses to jump are really excellent.

It is impossible to over-emphasize some of Major Paterson's advice; especially is this so regarding some matters to which very brief—if any—reference is made in most textbooks, presumably because they are considered to be of minor importance, e.g., on p. 30: "Nothing frightens a horse so much as silence. In the training of young horses the voice plays a large part. Talk to your horse in a natural, confident, quiet tone." Advice of untold value; would it were always followed. Again on p. 47, when dealing with the various stages in the training of the young horse to jump: "It is impossible to lay down any fixed time limits for the first three stages, as it must depend on the age, temperament and capabilities of the horse. . . ." We entirely agree; one not infrequently hears rules laid down as to the steps to be taken "at end of first week," "at the end of second week," etc., as if all horses were exactly alike and capable of being trained in precisely the same way.

Horses and dogs vary in temperament and capacity for learning just as children do, and, while broad rules and sound advice are invaluable, yet the application of these rules must vary with the individual.

The chapter on "Hands" will bear rereading many times; on p. 75 the author writes, "I give my own opinion for what it is worth"—and then ensues a couple of pages which are worth a very great deal indeed; we have never seen the matter put more clearly or more soundly.

The section on "The Horse's Mind" appeals to us very forcibly, and it is very evident that the author is a genuine horse lover as well as being a master in horse management and handling. When reviewing a book with which one is so much in agreement and sympathy one finds it difficult to select points for other than favourable criticism, and consequently the following remarks are more in the nature of suggestions. Page 19, the reason for lack of flexion power in certain horses is ascribed to "lack of

room for the play of the atlas bones, tightness in the gullet due to extra large glands. . . ."

We think that this might have been put with greater accuracy and lucidity, and we suggest that the author's meaning would have been conveyed more clearly by an outline sketch of "A well set on head" and "A badly set on head, a horse that will never bend well."

We cannot quite agree with the statement on p. 29 that "It may become necessary to provoke a fight in order to show the horse once and for all that the man is master." We quite agree that *if* the fight arises there can, and must, be only one issue to it; the man must be master at the termination of the conflict of wills, but we do not like the idea of intentionally *provoking* such a conflict.

Still, these are minor points; the book is an excellent one and well merits a place in the library of everyone who is, or aspires to be, a horse owner. "Sympathetic Training of Horse and Man" is a book to read, reread and reread again. J. G.

POST-GRADUATE MEDICAL JOURNAL. Wakley and Son, Ltd., 1, Bedford Street, Strand, W.C. Price 6d. Annual Subscription, 6s. post free.

We welcome the first two numbers of the *Post-Graduate Medical Journal.* This Journal, which is published monthly, is the official organ and mouthpiece of the Fellowship of Medicine and Post-Graduate Medical Association. The first number contains, as a supplement, a comprehensive programme of lectures and demonstrations which cover every branch of medical teaching obtainable in London, the fees for which are moderate and vary according to the periods of instruction.

The Journal has been founded to give to all an account of what post-graduate work is being done in this country, and for the publication of specially contributed articles, clinical descriptions, and a selection of lectures which are delivered at the instance of the Fellowship of Medicine. It is stated that only such subjects as will, from their essentially practical character, make the strongest appeal to the general practitioner, will be selected for publication. The opening paper on "Medical Aspects of Gall Stones," by Sir Humphry Rolleston, and Dr. Edin's paper on "Puerperal Sepsis" certainly fulfil this object.

The second issue of this periodical contains a valuable paper by Sir Thomas Horder, entitled "Some Cases of Pyrexia without Physical Signs," the perusal of which will enlighten those of us who, in our ignorance, are sometimes constrained to call a fever P.U.O.

The Fellowship of Medicine is an institution which should appeal to Service medical officers when at home, and the *Post-Graduate Medical Journal* fills a gap in medical literature, for we know of no other medical periodical which caters so exclusively for the general practitioner.

We commend it to our readers.

Correspondence.

AERIAL TRANSPORT OF SERVICE CASUALTIES.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—In common, I feel sure, with a very large number of brother officers, I read with great interest Wing Commander Treadgold's article in the November Journal on the " Aerial Transport of Service Casualties."

As a matter of fact I had been wondering how long it would be before a prophet would arise who would enlighten the land medical service as to some of the problems that have to be met by our colleagues in the air.

Serving in Iraq, one does very much appreciate the immense advantages that aerial has over land carriage under certain circumstances, and, if I may say so, here, one also learns after a time the limitations to which air-ambulance carriers are subject. As an instance of the first consideration, I might be allowed to mention a case that occurred in this country in May, 1925. A column of "Levies" was proceeding from Sulaimania to Halebja, a distance of about seventy miles, and when about half way on its journey was pretty vigorously attacked by tribesmen in greatly superior force. The "Levies" suffered numerous casualties, but got into Halebja safely in the end, complete with all their wounded. The Medical Officer to the Levy Force was a very able young sub-assistant surgeon, but he certainly would have had his hands full had he had to look after a score of badly wounded men in nothing much better than his camp hospital. The R.A.F., as always, came to our rescue immediately, and in less than a couple of hours after loading the Halebja wounded were in a comfortable brick-built hospital in Kirkuk, 120 miles away. The men could not have been transported by road at all, as, owing to enemy action, no convoy could move between Halebja and Sulaimania. In this instance, the machines used were D.H. 9A, " Nine-acs," as we call them out here. Only one case—a gun-shot wound of thigh—had to go in a Neilson, the others were all able to travel in the observer's seat as sitting cases. Later on the big Vernons were used for evacuation of sick and wounded from Sulaimania. But of course it is not everywhere in Kurdistan that the big air-ambulances can land, and the "Levies" in particular have several stations which are inaccessible to the large machines, in which case we are dependent on the two-seater fighting 'planes.

I am not at all sure that we, as a corps, as yet fully realize what tremendous advances have been made in the matter of moving sick by air travel. Here in Mosul, for instance, it is quite unnecessary to have an officers' ward or sick quarters on a large scale. All that it is necessary to maintain, and all that the P.M.O., R.A.F., Iraq, does maintain, is a kind of " reception station" for his sick officers. For anything beyond a trivial ailment, down goes a W/T and up comes the air-ambulance. It is nearly 300 miles from Mosul to Hinaidi, but in reasonable weather you travel the distance in extreme comfort.

But what I think does constitute one of the lesser problems of the air-medical service is to find some improvement on the Neilson stretcher. I

showed the very excellent photographs illustrating Wing Commander Treadgold's article to a friend of mine who is a Corporal in the R.A.F., and asked him if he recognized the Neilson. "Oh, yes," he answered, "that's what they carry the dead'uns in." And that, in my humble view, is about all it is fit for. You are bound hand and foot and head and every part of you in a Neilson; you are, in fact, in a leather-cum-canvas coffin. If I could help it nothing would induce me to travel in one of these contraptions. Supposing you had a tickle on your nose! Further, how in the hot weather out here any one survives being shut up in it I do not know. A squadron leader who was merely demonstrating the Neilson to me (it was in the middle of July) was taken out very much the worse for his experience.

There is just one other point I should like to stress in regard to shifting wounded by air. One often hears it said, what a lot of time is saved. Well, is it? For an individual, most certainly, but not, I think, in bulk. Imagine, for instance, aerial transport from a C.C.S. in France to Croydon, and thence by car to a hospital in London. Supposing you have got 400 cases to shift, you are not going to save much time over ambulance, train and steamer unless you have a very large number of air-ambulances. By all means select special cases and send them by air and your contention about saving time is then perfectly true, but as far as dealing with the very large number of casualties, characteristic of a war on a large scale, then I think that train and car is the speedier.

I am, Sir,

D. S. SKELTON,

Lieut.-Colonel, R.A.M.C.

Senior Medical Officer, Iraq Levies.

Mosul,

December 29, 1925.

PREVALENT TYPE OF DYSENTERY IN INDIA.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

I HAVE received a personal letter from Major R. Knowles (Professor of Protozoology, School of Tropical Medicine, Calcutta), concerning an article of mine on the above subject, which appeared in the February number of the Corps Journal.

The letter appeared to me to contain so much important matter regarding the points I tried to emphasize in the article, that I requested Major Knowles to allow me to publish extracts from it in the Journal. He was good enough to consent, and the extracts given below are taken verbatim from his letter.

The points I endeavoured to make were:—

(1) Our findings in the Poona district for the past year show bacillary dysentery to be much commoner than amœbic dysentery. This agrees with the work of certain civil laboratory workers in some other parts of India, but not with the statistics of either the British or Indian troops in India in the past.

(2) Emetine is largely administered to those suffering from intestinal troubles, without the diagnosis being verified in the laboratory, and without an understanding of the dangers connected with the use of the drug.

(3) Laboratory reports in the past have probably helped to foster the existing misapprehension, the observer having probably mistaken certain tissue cells for protozoa.

(4) The doubts felt regarding the correct laboratory diagnosis of specific amœbæ were due to the fact that very rare conditions seem to have been seen fairly frequently in acute dysentery stools containing blood and mucus, without exciting comment, and specific diagnosis made, which skilled protozoologists would not attempt. These were:—

(*a*) *Entamœba histolytica* and cysts in the same specimen.
(*b*) Precystic forms of *E. histolytica* present.
(*c*) Dead amœbæ.
(*d*) Cysts of *E. histolytica* present.

Major Knowles' comments are as follows:—

(1) There is no question about it; the misuse of emetine is rampant and does no end of harm.

"It soothes the bowel," you quote. It does not; I have seen the actual graphs after its experimental use on cats in Chopta's lab. It causes irregular and often violent peristalsis; the normal rhythmic peristalsis of the gut is seriously interfered with and rendered erratic and strained. Its use in bacillary dysentery can do nothing but harm.

"The pathological condition of the intestine in bacillary dysentery is largely of moment only to the pathological specialist." Why not rub in that the whole of modern scientific medicine depends on pathology? You cannot treat a disease if you cannot understand and visualize for yourself what is going on inside the patient, and the conditions in his tissues and blood. Anything else is quackery, whether practised by a man with a medical degree or without one.

(2) "Cysts in the stool." (*a*) In acute amœbic dysentery I, at least, have never seen them. The usual finding is actively motile *E. histolytica* in its vegetative form, and the diagnosis is usually readily made with the microscope. I can just conceive of a state of affairs where part of the colon was severely ulcerated, i.e., acute amœbic dysentery with the passage of vegetative entamœbæ in the stools; but another part of the colon only trivially ulcerated, cysts having time to form as the entamœbæ from here emerge into the lumen of the gut; so that one might find both vegetative forms and cysts together in an amœbic stool. But I have never yet seen this condition.

On the other hand it is not uncommon to find an occasional cyst or even vegetative form of *E. histolytica* in a case of bacillary dysentery in a histolytica carrier.

(3) In the amœbic convalescent, and in the carrier state, the finding in stools *entirely depends upon the intestinal state of the patient.* Should he pass a diarrhœic or fluid stool, one may encounter motile, vegetative, *E. histolytica*, but only, as far as I know, in very scanty numbers. In his formed stools one gets cysts at the 1-, 2-, and 4-nucleate stages: but the 4-nucleate form the greater majority—about sixty per cent of all forms present, I should say. Should the stool be a pasty one, one may get everything simultaneously: scanty vegetative forms, pre-cysts and cysts at all stages of development.

Mixed amœbic and bacillary infections are not uncommon: not as uncommon as I once believed. Fletcher at Kuala Lumpur, on a very

admirable study of the subject on post-mortem material, estimates that some twenty-five per cent of cases are mixed. But, even here, I think that one infection predominates at any one time, the case is either and usually bacillary dysentery in a histolytica carrier: or—very rarely, and I have not encountered it—amœbic dysentery in a bacillary carrier. But the same patient may often go down with bacillary dysentery at one time, and a month or two later with amœbic, or vice versa. I have seen this happen not infrequently.

"Dead amœbæ": no one can identify them. They consist simply of inert irregularly shaped masses of extensively vacuolated protoplasm.

"Macrophages": *this is the cardinal error.* It is on the finding of numerous macrophages with ingested R.B.Cs. that all these erroneous percentages of amœbic infection are based. Both motile, vegetative *E. histolytica* in a fresh amœbic stool, and its cyst with its unmistakable chromatoid bars and typical nucleus in the iodine emulsion, cannot be confused with anything else: but the man who hasn't learnt or won't learn calls the first macrophage that he sees *E. histolytica.*

If cysts plus vegetative forms ever occur together, it is not in the acute amœbic stool, but in a semi-fluid stool in a carrier.

District Laboratory, I am, etc.,
Poona. J. A. MANIFOLD,
December 15, 1925. *Major R.A.M.C.*

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Any demand for *reprints, additional to the above,* or for excerpts must be forwarded at the time of submission of the article for publication.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are inserted free of charge to subscribers. All these communications should be written upon one side of the paper only; they should by preference be typewritten; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS." War Office, Whitehall, S.W.1.

The Committee has sanctioned the publication of correspondence on matters of interest to the Corps, and of articles of a non-scientific character under a nom-de-plume. These communications must, however, be approved by the Editor before publication.

Cheques or Postal Orders for Subscriptions, etc., should be made payable to the "Hon. Manager, Journal R.A.M.C." and crossed "Holt & Co."

All communications should be addressed to THE HON. MANAGER, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," WAR OFFICE, WHITEHALL, S.W. 1.

No. 4. April, 1926. Vol. XLVI.

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

LIEUTENANT-COLONEL A. E. HAMERTON, C.M.G., D.S.O., R.A.M.C.

ISSUED MONTHLY

Printed and Published by

JOHN BALE, SONS & DANIELSSON, LTD.

83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

Price Two Shillings net.

Vol. XLVI. April, 1926. No. 4.

Journal

of the

Royal Army Medical Corps.

Original Communications.

MALARIA IN PALESTINE.

A Summary of Anti-Malarial work Carried out with the 54th Division in the Mulebbis Area, April to June, 1918.

By Colonel C. E. P. FOWLER.

Late A.D.M.S. 54th Division.

The 54th Division moved into the Mulebbis area during the early part of 1918, and on March 12th, a further advance was made by the taking of Mejdel Yaba, and a pushing forward of the line to the North of the Wadi Deir Ballut.

During the early part of April all preparations were made for a general advance, but at the last moment, owing to the uncertain conditions on the Western Front, the whole scheme was postponed. In the middle of April it was definitely understood that the Division would remain for some length of time in its present location.

It was therefore necessary to make preparations for a malaria campaign. A glance at the map at once demonstrated the probability of a large part of this country being highly malarious, and a ride across the actual ground made this suspicion a certainty. In addition, the history of the area is one of bad repute, and it has been shunned by all natives who could find a home elsewhere. In the Auja area, only two small squalid villages were in existence, East and West Mirr, and it is probable that the inhabitants left these during the summer for more salubrious surroundings.

In spite of the delightful gardens and orange groves along the low ground about the rivers Auja and Lejja, the only houses to be seen were those built for engine plant, and for storing and packing fruit. It was very evident that the owners did not allow their employees to spend the nights near their work for fear of losing their services. A well-known native of the country related that the first Jews who endeavoured to form the colony of

Petah Tikweh[1] (new Mulebbis) some forty years ago were so decimated with malaria that they had to give it up in despair. This effort was made on the lower and richer ground. Their successors wisely chose the high ground, well away from the rivers, and have escaped to a very large extent from the sufferings of their predecessors.

The position which faced the Division in the middle of April was briefly as follows: One Brigade was in the line along the River Auja from Ferrikhiyeh Bridge to the source of the river at Ras el Ain. Another Brigade occupied the remainder of the line eastwards.

The remaining Brigade was in reserve and interchange took place about every fortnight. The health of the Division was good, practically no malaria cases were occurring, and the prospect of a peaceful summer spent amidst pleasant surroundings, and in a salubrious climate, might have been looked forward to.

The first note of warning regarding the danger of the Auja position was issued on April 19, within a day or so of the decision for the Division to stand fast.

Surveys from a malarial point of view were at once commenced, and all possible information obtained regarding the incidence and character of the disease as likely to be met with in those areas in which the troops were located.

It was at once appreciated that the dangerous zone would be that around the rivers Auja and Lejja, and that it would be necessary to concentrate all one's energies upon ameliorating the conditions in this area. The term "ameliorate" is properly used, for it was quite evident to anyone with an experience of malaria that to "prevent" was out of the question. The utmost limit of one's hopes would be a toleration of the conditions, so that the troops would be able to remain and still exist.

River Lejja.

Work was commenced on the River Lejja. The bed of the stream was of a narrow winding character, some seven thousand yards in length. The banks were steep, and in many places twelve feet or more above the stream. They were densely overgrown with an impenetrable tangle of trees, brushwood and canes, so that it was impossible to follow up the course directly. Water was not continuous in the bed, but broken up into long, deep pools. The whole stream formed a perfectly ideal breeding ground for the anopheline mosquito. At this time (April) larvæ could be readily found, but they were small, and the season had evidently not yet set in.

Twelve hundred Egyptian Labour Corps natives, supervised by British N.C.O.'s and directed by the C.R.E., were put on to the task of clearing this stream, and in the space of three weeks they completed their work. The whole of the banks were cut and cleared of vegetation. The bed of the stream

[1] Petah Tikweh is situated about 8 miles to the north of Jaffa.

up to two hundred yards above Long Wood was graded, channelled and the sides trained, and the gradient was found to be so satisfactory that the whole of the water was allowed to drain to the lower end and the top bed filled up as the water left it. Thus the whole Lejja was rendered dry with the exception of a large pool of two hundred and thirty yards at its junction with the Auja, and several large pools at the source. It was not possible to deal with the former at this time, as the height of the Auja would not allow of its draining. As the Auja fell this was possible in July. The pools at the source were to be filled in, but the Division left the area before this was done, and the 3rd (Lahore) Division carried out the work in July. After the bed of the Lejja was filled in water seeped through gradually in many places, but only a little further filling was required to render it safe.

River Auja.

The river Auja with its various tributaries was taken in hand during May. In the previous month little breeding could be found going on in the river, and being a very rapid stream, it was hoped that it might not prove a great source of danger. This was the opinion expressed by the entomologist, E. E. F., and by several other officers with experience of malaria. However, these hopes were to be entirely falsified. As one explored the river and its surroundings, one was driven to the conclusion that it would prove only too favourable a breeding-place for anophelines, and these conclusions were confirmed by the finding of an increasing number of larvæ as time went on. It was evidently necessary to take prompt action, if any hope of the troops remaining was to be expected.

The prospect of dealing with the river and its surroundings appeared to be such a hopeless one, that it was deemed wiser to put forward the suggestion of withdrawing the line behind the Lejja on to the higher ground, rather than to enter upon such a stupendous task.

It was decided, however, to continue holding the line, and to carry on anti-mosquito work with the utmost speed and with all labour available, and to hope for the best. Military exigencies must outweigh all ideas of rational procedure as based on civil experiences. To have contemplated the rendering of this area mosquito-free and reasonably safe to spend the summer months in would have drawn ridicule and derision on any expert who could have had the audacity to recommend it to a civil community. No possible reason, outside military necessity, could have warranted the enormous expenditure of time, money and labour on such a problematical undertaking.

It was pointed out that, in spite of every effort which might be made to prevent it, the Division must be prepared to lose a Brigade by holding the line. Further, it was recommended that one Brigade only should be exposed to the risk, in order to save the whole Division from becoming infected. The forecast above made proved a fairly accurate one. Up to September 19, the 54th and 3rd Divisions had lost just on two thousand

men. If the 54th Division had remained in that area, it is probable that the figures would have been larger, the whole force being British.

Large detachments of British Infantry were put on to the work of cutting and clearing the banks of the Auja. It is impossible to depict accurately what labour this involved.

From Ras el Ain to Ferrikhiyeh Bridge the river winds to such an extent that although the distance direct is only about five thousand yards, yet taking the measurement along the banks, the distance is more than doubled. This meant that a clearing of twelve thousand yards or more had to be carried out on each bank. The banks were heavily overgrown with willows, canes, bananas and papyrus, to say nothing of dense scrub and vegetation of all kinds. In parts the river scenery was almost tropical in appearance, and formed some beautiful pictures.

In the upper two miles the water was only 2 or 3 feet below the ground; in the middle and lower reaches the banks were 12 to 20 feet high and very steep. It is a rapidly flowing stream which rises from innumerable springs at Ras el Ain and commences at once as a fast-flowing river. The supply is inexhaustible and is evidently the outcrop of underground water originating amongst the hills to the east. The level fell about twelve to eighteen inches from May to August, but this was largely owing to the clearance of all obstruction in the lower reaches and to the water passing off more quickly.

After some days a Battalion of Sikh Pioneers (1/34th) was lent to the Division to help with the work, in order that it might be pushed on as rapidly as possible. One cannot speak too highly of the manner in which these men tackled their job. Within a period of three weeks the rough clearing of the sides had been nearly completed, and a large amount of training and dressing of the banks had been carried out. The men appeared to enjoy their duties, wading and swimming in the river, hauling at trees and hacking at undergrowth, and the results they produced were certainly astounding. It showed what could be done with one thousand men more or less expert at the work in such a short space of time. It is casting no slur on British Infantry to say that they could not have attained the results in anything like the same period.

In the reach of the river between Ras el Ain and El Mirr, numerous marshes supplying tributaries to the main river were drained, and many of these rivulets cleared and channelled up to several hundred yards from the Auja. This whole tract was like a huge sponge containing water, which oozed out all along the sides and banks of the main river. These conditions became more and more evident as Ras el Ain was reached. At the top end or source the springs opened out over an area of several acres extending to the north side of the castle[1] itself. It was found possible to work in the lower reaches of the river without molestation by the enemy, but around

[1] One of the Crusaders' old castles.

Ras el Ain great care had to be taken not to expose any working party to view, otherwise shell fire was at once drawn upon them. It can be understood that this interfered considerably with major operations around this area. It was, unfortunately, necessary to withdraw the Sikh Pioneers before they had time to complete the work between Ras el Ain and El Mirr. A large amount of clearing and channelling of the innumerable rivulets running into the Auja remained to be done, as also the clearing and opening of various pools and backwaters joining the river.

British Infantry continued the work. The islands were burnt and cleared of vegetation and the whole of the dense jungle at the head springs opened out ready for channelling and training.

In addition to the main river it was also necessary to deal with the various tributaries joining it on the north bank, namely, the wadis Rabah, Dhaheb, Ishkar and Adas. These were small shallow wadis, containing pools of water at intervals and densely overgrown with brushwood, high grass, reeds and thistles, and formed ideal breeding places for anophelines.

As the sources of these streams all came from the direction of the enemy's line, it was only possible to deal with them up to certain points. This was carried out and the streams drained, channelled or filled up to about a distance of two thousand yards into "no man's land." Patrols reported that pools were present beyond this line, but these were so near the enemy's trenches that it was unsafe for working parties to tackle them. The most that could be done was the spreading of oil occasionally.

Wells and Cisterns.

Wells and cisterns were regularly inspected and oiled. There were several hundred of these scattered over the area. By cisterns are meant holes in the ground, cut out of rock or built in cement. During the rains water flows into them from the surrounding ground and they form excellent harbourage for mosquitoes. They are scattered indiscriminately around villages, and are often most difficult to locate. Many of the cisterns and wells were filled in and cemented over, others were pumped out. Amongst the orange and lemon groves, pumping arrangements were present, but many of them were broken or out of repair. Just before the Division left the area, the owners were commencing pumping, or repairing the machinery to do so. As was anticipated, considerable difficulty was experienced in getting the owners to take any trouble regarding the distribution of the water for irrigation, and in consequence it required a special staff to watch the gardens alone.

Tel Abu Zeitun Marsh.

The Tel Abu Zeitun Marsh, which was over two thousand yards in length by five hundred yards in width at the eastern end, was a difficult problem to tackle.

Ditches and cross channels were made in it from below upwards and the

water was slowly drained off, but even at the end of June there was a quaking bog of some acres at the top end. The reeds were cut to help evaporation, and eventually oiling had to be resorted to in order to stop the breeding going on. A line of natives with oil cans and sprays was led across the marsh, oiling as they went.

Minor Preventive Measures.

As regards preventive measures outside major operations, the following procedures were employed :—

(1) Systematic lectures and instruction by medical officers to all units, with the formation of small "museums" of simple interest.

(2) Rigorous enforcement in the use of the bivouac mosquito nets. This pattern, when properly used by two men in a bivouac, answers its purpose admirably, but the nets must be regularly inspected by regimental and medical officers, and any repairs insisted upon at once. Systematic inspection at night, after the men have turned in, must also be made in order to ensure that the nets are being properly used, and any carelessness must be met by disciplinary action.

(3) Some fifty mosquito-proof huts to accommodate three or four men on detached duties were also made, but these proved of little use, as the wood soon warped, and the men could not be made to appreciate what extreme care was necessary in order to render them in any way effective.

(4) Repellant ointment, vermijelly and Oxford grease were also issued for men on night duty. Opinions were very divided as to their efficacy, but of the three, vermijelly appeared to have the most desired effect. Oxford grease is too dirty a material for the purpose.

Varieties of Anophelines.

The anopheline mosquitoes found were as follows :—

A. mauritianus.—Common in May and June in the natural waters around the Auja.

A. superpictus.—Common in May and June in the natural waters around the Auja.

A. maculipennis.—Common in June from artificial waters, also from natural waters.

A. hyrcanus (*sinensis*).—Common in June from marsh and backwaters.

A. algeriensis.—Not common, but several specimens were bred out from larvæ gathered in natural waters.

A. bifurcatus.—Found in the earlier part of the year from wells and cisterns.

It is impossible to state which of these mosquitoes is the most virulent carrier in this district, but if pressed for an opinion, the palm would be given to *maculipennis*, with the *superpictus* a close runner up.

Administration.

As regards the administration of malaria measures, the whole area was divided up into four sectors, each one controlled by a Royal Army Medical

Corps officer specially trained in the work. Under these was a staff of men from the Divisional Sanitary Section or Field Ambulance, who spent their time in searching and inspecting the various areas, and taking such preventive action as was deemed advisable. One officer was also specially told off to watch all the major operations on the Auja and its tributaries, and to advise the officers or N.C.O.'s actually in charge of the working parties. He was also responsible to the A.D.M.S. for gathering all possible information, and for collecting specimens and other material.

The A.D.M.S. was the general adviser on all operations to be undertaken. From an engineering point of view, these were worked out in co-operation with the C.R.E. of the Division, without whose most generous help it would have been impossible to proceed. Throughout the operations it was only necessary to make a suggestion and the most willing endeavours were made to meet it in every possible way.

Result of the Operations Undertaken.

When asked for an appreciation of the situation in April, the opinion was given that it would not be possible to hold the line on the Auja, unless an extraordinary sacrifice of troops was to be made, or unless an heroic effort was to be undertaken in the shape of operations to render the area more or less habitable.

It was decided that the line should be held, and the second alternative was adopted. When once this decision was come to, there was no hesitation in getting on with the necessary work, and every possible help was granted by all concerned. It was pointed out at the time that the whole scheme would simply be a vast experiment, and that disappointment must not be felt if it should prove a failure. One cannot make a dead-set against nature without its costing a heavy price.

In this instance it was the direct decision to sit down in one of the most deadly and malarious spots in the world and to remain in it during the worst months of the year. What was the result? The infection of about two thousand men with the malaria germ, and the incapacitating of these men for military purposes for a certain length of time. Can this be looked upon as a failure, or as a success?

Let us imagine for one moment what would have happened if this force had remained as it was, and anti-malaria measures had not been undertaken.

There can only be one answer to the question as to what would have been the result. The force would have completely melted away.

This was the fate of a large part of the Turkish forces placed in similar positions to those occupied by us on the Auja. The remnants showed only too plainly what their experiences had been.

It may be stated without gainsaying that our victory over the Turkish forces on the western side of the line was primarily due to our being able to outlast the Turk as regards the health and fitness of the troops. Their

moral and discipline were completely shattered by sickness, due to the occupation of malarious areas. Ours suffered certainly, but to nothing like the same extent. The two Divisions which occupied the Auja Sector, and the Division located in the Coastal Sector, have all been able to take a very leading part in the active operations since September 19. This is the greatest proof of the success of the efforts made. Not only may the measures be looked upon as having been successful, but they stand as a triumph of preventive medicine, and as a lasting example of what can be done in the fight against the worst malarial conditions. The opportunity for such an experiment is never likely to occur again, as no civil community in its senses could ever entertain such a project or countenance such a vast expenditure of money and labour for no financial return.

Statistics.

The weekly number of cases of malaria in the Division was given, but they were almost valueless as regards a bearing on the causes and effect of residence in the Auja area, with the exception of the few weeks in June and July. The Division left the area on June 27, and it is roughly estimated that the last week's stay there cost the troops nearly one hundred cases of infection. In other words, the height of infection was just commencing. This is proved also by the figures of incidence in the 3rd (Lahore) Division. The residents of Mulebbis also agreed that cases of malaria used to commence about the middle or end of June.

The period of incubation was an interesting point brought forward by the A.D.M.S., 3rd Division. Charts made out by him appear to prove conclusively that infection contracted in this district takes much longer to mature than the recognized period of ten days. The charts demonstrate from sixteen to twenty days as the usual period of incubation, and the experience of the 54th Division also agrees with these figures.

The Cost of the Operations.

It may perhaps be interesting to consider for a moment the approximate cost of the works carried out, i.e., such as would be borne by a civil community undertaking similar operations. This can be reckoned as "working days" during the period April 20 to June 27. They may be put down roughly as follows :—

River Abu Lejja ..	1,200 E.L.C. for 22 days	=	26,400	working days
River Auja	1,100 Sikhs ,, 25 ,,	=	27,500	,,
and its tributaries ..	1,000 British ,, 30 ,,	=	30,000	,,
Tel Abu Zeitun Marsh ..	1,000 E.L.C. ,, 40 ,,	=	40,000	,,
			123.900	working days

Taking the average value of a man's service, including pay and food, at 3s. per day, the 123,900 working days would cost a sum of £18,585. If to this be added the value of special services and materials, the amount expended would easily reach £20,000, and this sum may be taken as a fair cost of the operations undertaken by the 54th Division.

DENTAL SEPSIS, ITS NATURE AND SYSTEMIC EFFECTS.

By Captain S. H. WOODS.
The Army Dental Corps.

(*Continued from p.* 184.)

SECTION I.—SUBDIVISION (c).

Bacteriology.

The mouth presents ideal conditions for the growth of bacteria. It is moist, has the optimum temperature for growth, and contains an abundant and suitable food supply. Unlike other cavities lined by mucous membrane, it lacks any definitely known bactericidal substance. While saliva constantly flushes the mouth, carrying away large numbers of its normal inhabitants and adventitious germs taken in with food, and while phagocytes are incessantly passing up between the epithelial cells to ingest them, reinfection is constantly taking place from the numerous mucous crypts and ducts opening into it.

"That there are so few suppurative lesions after operative interference in the mouth is due to the great vascularity of the mucous membrane, which forms lines of communication for the light infantry of the body—the polymorphs—to advance and attack any organisms that may be present, and later for the heavy artillery—the macrophages—which remove the grosser damaged portions of tissue and cells."[1]

One hundred to one hundred and fifty different kinds of bacteria may be isolated from an average mouth. Such organisms include cocci, bacilli, spirochætæ, leptothrix and amœbæ. There is a constant balance between the bacteria and the lining mucous membrane of the mouth. In the healthy individual the bacteria, though constantly present, are unable to overcome the resistance of the tissues. If, however, this resistance is lowered, as it can be by a variety of causes, then the micro-organisms exert their pathogenic effects and infection results. This upset of balance, by lowering the tissue resistance, may be caused :—

(*a*) *Mechanically*, as by tartar, the edge of filling or crown, and impaction of food.

(*b*) *By exogenous toxins*, as in metallic gingivitis.

(*c*) *By endogenous toxins*, as in fevers, in which there is a marked decrease in oral secretion and stagnation at the gum margin.

(*d*) *By the lack of vitamins*, as in scurvy, where there is softening and bleeding of gums with resultant infection.

(*e*) By pressure from dentures which are not kept clean.

---

[1] "Some Bacteriological Problems involved in Dental Practice." By J. W. S. Blacklock. *Dental Record*, April, 1924.

"The organisms on healthy teeth have been carefully enumerated, and it was found that under ordinary conditions one milligramme of surface deposit contains about 25 million organisms, of which one million can be cultivated. Cocci formed 60 per cent of the total flora, and streptococci 40 per cent. These numbers increased at night and after meals; they were about four times as great on unbrushed as on brushed teeth. In dirty mouths the bacilli increased more than the cocci, and anaerobes predominated."[1]

The subject of dental bacteriology is still in its infancy, and as no uniform technique or nomenclature is adopted by investigators, textbooks present a bewildering series of classifications and names. It has been shown that the mouth is sterile at birth. Organisms appear ten hours after birth, especially the *Streptococcus salivarius,* which becomes the predominant species from the twelfth day.

With the appearance of teeth in the infant mouth it was observed that leptothrix, spirochætæ and certain anaerobes, such as fusiform bacilli, appeared, because the accumulation of food in the gingival crevices is favourable to their growth.

It has also been shown by various investigators that an examination of the saliva gives a good index of the bacteria present in the mouth, and it may be of interest to indicate the usual flora present:—

FLORA IN TWENTY-FIVE NORMAL SALIVAS.[2]

Organism	Percentage incidence
Pneumococci (by culture)	3
do. (by mouse) Group IV	40
Streptococci	100
M. catarrhalis and meningococcus	3
M. chromogenicus I and II; + *M. pharyngis siccus* and unidentified strains	73
Staph. aureus	2
Staph. albus; M. candidus group and unidentified strains	23
Lactose fermenting bacilli; *B. coli*	2

It will be noted that the streptococci occur in every case. Under pathology we have seen that infection of the periodontal membrane is caused by the access of saliva. It is therefore a mixed infection, but the present trend of investigation goes to show that the greatest importance is to be attached to the streptococci on account of their invariable occurrence, their predominating numbers and their pathogenicity.

The classification of the streptococci is still imperfect, and the one used here is that of Holman (1916), in which they are divided, firstly into hæmolytic and non-hæmolytic, and secondly into species according to their fermentation reaction in lactose, mannite and salicin.

[1] "Organisms found in Periodontal Infections." Prof. E. E. Glynn. 1923. Lectures by Dental Board of United Kingdom.

[2] Taken from a graph by Prof. Glynn (Dental Board of U.K. Lectures).

HOLMAN'S CLASSIFICATION OF STREPTOCOCCI.

Hæmolytic	Reaction to Lactose	Mannite	Salicin	Non-hæmolytic
S. infrequens	+	+	+	*S. fæcalis*
S. hæmolyticus I	+	+	−	*S. non-hæmolyticus* I
S. pyogenes	+	−	+	*S. mitis*
S. anginosus	+	−	−	*S. salivarius*
S. hæmolyticus II	−	+	+	*S. non-hæmolyticus* II
S. hæmolyticus III	−	+	−	*S. non-hæmolyticus* III
S. equi	−	−	+	*S. equinus*
S. subacidus	−	−	−	*S. ignavus*

The non-hæmolytic type is subdivided into two groups:—

(*a*) *Viridans,* which produces greenish coloration when grown on blood agar, owing to the formation of methæmoglobin. They comprise the first four species of the above table, and are regarded as being definitely toxic. The *S. salivarius* is the predominating species found in all chronic dental lesions.

(*b*) *Indifferent group,* comprising the last four of the table. These are not considered of such importance as the viridans group, and are non-toxic to guinea-pigs.

The following percentage incidence of the various species of streptococci in the twenty-five normal salivas mentioned before is taken from a graph by Prof. Glynn.

DIFFERENTIATION OF STREPTOCOCCI IN TWENTY-FIVE NORMAL SALIVAS.

Hæmolytic	Percentage incidence	Non-hæmolytic	Percentage incidence
S. pyogenes	3	*S. fæcalis*	10
S. anginosus	3	*S. non-hæmolyticus* I	8
Other varieties absent		*S. mitis*	33
		S. salivarius	85
		S. non-hæmolyticus II	Nil
		S. non-hæmolyticus III	Nil
		S. equinus	25
		S. ignavus	35

In order to investigate the types of streptococci present in the periodontal membrane and root-canal of infected teeth, thirty-five were investigated in the Research Laboratory of the R.A.M. College, and the following technique was adopted throughout.

As far as possible contamination during extraction was limited by the following means. Upper teeth were chiefly selected, and only a small number of lower teeth, because of the difficulty in keeping saliva from them. The interdental spaces were cleansed of tartar and food debris, and after the usual hypodermic injection of local anæsthetic had been carried out, the interdental spaces were atomized with hot 5-vol. hydrogen peroxide. The site of operation was then kept free from saliva by the use of sterile wool-rolls and the saliva ejector.

The tooth to be extracted and its neighbours were swabbed several times with absolute alcohol, which was allowed to run over gum margin and interdental space. Between each swabbing the alcohol was evaporated by hot air to dehydrate the area, until it was considered as sterile as possible.

The blades of sterile forceps were kept in absolute alcohol; the fingers

were rendered surgically clean and immediately before the extraction were dipped in alcohol; the forceps were then picked up and the blades passed over a flame to burn off the alcohol; the tooth was extracted slowly and carefully to avoid any unnecessary damage to the investing tissues, and placed at once in the centre of a sterile piece of lint two inches in diameter, which was rapidly folded round it and dropped into a special sterile test tube 1½ inches in diameter, which accommodated it easily, and at once dispatched to the laboratory. Here the following technique was adopted :—

Cultures were first taken from the apical region of the periodontal membrane by means of a platinum loop moistened with a drop of glucose broth. The periodontal membrane was then burnt off, the tooth cracked open with sterile bone forceps, and a further culture made in the same way from pulp, root-canal or root filling. At first only glucose broth was used, but later in the series cultures were made in both ordinary and glucose broth.

These cultures were incubated overnight, and then plated : (*a*) on Fildes' medium from glucose broth; (*b*) on ordinary agar from ordinary broth. The plates were examined after twenty-four hours under low-power, various colonies picked off, cultured in glucose broth and put through the sugar media and plated on blood-agar for the hæmolysis test, in order to identify the organism.

Appropriate steps were taken to identify organisms other than streptococci, which grew. They occurred very rarely. The teeth examined are divisible into two groups :—

(1) Those involved in pyorrhœa but showing no caries of the enamel, i.e., infected via the gingival trough.

(2) Those which were not involved in pyorrhœa but which had received root-canal treatment (followed by crowning in some cases), i.e., infected via pulp.

The results were as follows :—

Group I.—Open Sepsis.

Teeth involved in Pyorrhœa (External Infection of Periodontal Membrane).

Number examined, twenty-one.

Fourteen gave growth from membrane only, the pulp-canal being sterile.

Seven gave growth from both membrane and pulp chamber.

Organisms in periodontal membrane				Percentage incidence in 21 cases
S. salivarius	..	Present in 12	..	56
S. mitis ..	..	,, 8	..	38
S. fæcalis ..	..	,, 2	..	9·5
S. equinus ..	..	,, 1	..	5
S. ignavus ..	..	,, 1	..	5
Staph. albus	..	,, 1	..	5
Coliform bacilli	..	,, 1	..	5
M. catarrhalis	..	,, 1	..	5
B. influenzæ	..	,, 1	..	5

The last two organisms were present in a tooth with a chronic abscess following trauma.

Organisms from root-canal				Percentage incidence
S. salivarius	..	Present in 3	..	43
S. mitis ..	..	„ 3	..	43
S. equinus ..	..	„ 1	..	14
S. fæcalis ..	..	„ 1	..	14
S. ignavus ..	..	„ 1	..	14
Coliform bacilli	..	„ 1	..	14
B. Hoffmann	..	„ 1	..	14

Group II.—LATENT SEPSIS.

Teeth, not involved in Pyorrhœa, which had received Root Treatment.

Number examined, fourteen.

Growths were obtained from both periodontal membrane and canal or root filling in each case.

Organisms from membrane		Percentage incidence	Organisms from root canal		Percentage incidence
S. salivarius, present in 10	..	71	*S. salivarius*, present in 6	..	43
S. mitis, present in 4 ..	..	29	*S. mitis*, present in 4 ..	..	29
Other varieties absent ..	..	—	*S. fæcalis*, present in 4 ..	..	29

Comparison of Groups I and II brings out the following points:—

(1) The predominance of the viridans group.

(2) The high frequency of *S. salivarius*, the average percentage incidence being fifty-three, while *S. mitis* comes next with thirty-five.

(3) The mixed nature of the infection in Group I, where there is free access of saliva.

(4) The markedly reduced flora in Group II, where there was no free access of saliva.

(5) The fact that every tooth investigated in Group II gave growth from both root-canal and membrane, thus corroborating the previously quoted statement of Price and Mouldenhauer.

(6) The significance of the absence of the hæmolytic group.

It was difficult to obtain material for control, but I managed to extract, with every possible precaution, three upper first bicuspids from children aged 11. These teeth were absolutely intact as regards crown and gingival trough. They were erupting into an overcrowded arch and their removal was essential for regulation purposes. In each case the apical portion of root was still incompletely formed and the large patent foramen afforded wide contact with periodontal membrane.

The results were as follows:—

No growth from periodontal membrane in any case.

Growth from pulp in each case; *S. salivarius* occurring twice and *S. fæcalis* once. No other organisms were obtained despite every attempt to grow them.

The significance of these control results is as follows:—

(1) As the periodontal membranes gave no growth, it is presumed that they were sterile, and as similar precautions were taken to avoid contamination throughout the investigations, it may be presumed that it was, at any rate, of small importance as regards the results.

(2) The pulp may be infected early in life via the blood-stream, and this infection may be considered as "normal."

In this connexion it may be of interest to record the results of Kelsey[1] on a careful research into the bacteriology of the pulp.

In fifty sound teeth with intact crowns and normal pulps, he found only four were sterile.

In seventy-five teeth which had been filled or had untreated carious cavities, he found only five were sterile.

Total pulps examined, 125; sterile, 9.

Streptococci gave a percentage occurrence of 48·8.

Vaccines.—Fifteen teeth were sent to the Vaccine Department of the R.A.M. College for the preparation of autogenous vaccine, and though the organisms were not identified in every case, the following list, showing the results of the investigation, may be of interest because the teeth were from hospital cases with well-defined systemic disease.

Organisms (from which Autogenous Vaccines were made).

Case 1.	*S. salivarius*; *S. ignavus*.
Case 2.	*S. mitis*; *S. salivarius*; *S. pyogenes* (hæmolytic).
Case 3.	*S. mitis*; *S. salivarius*; *S. ignavus*.
Case 4.	*S.* non-hæmolytic species, not identified.
Case 5.	,, ,, ,, ,, ,,
Case 6.	*S. mitis*, practically pure culture.
Case 7.	*S.* non-hæmolytic species, not identified.
Case 8.	*S. subacidus* (hæmolytic). *S. salivarius*; *S. ignavus*.
Case 9.	*S.* non-hæmolytic species, not identified.
Case 10.	,, ,, ,, ,, ,,
Case 11.	,, ,, ,, ,, ,,
Case 12.	*S. salivarius*; staphylococci.
Case 13.	*S.* hæmolytic species, not identified. Staphylococci, *S. mitis*.
Case 14.	*S.* hæmolytic and non-hæmolytic species, not identified.
Case 15.	*S. salivarius*; *S. mitis*.

Here it will be noted that hæmolytic organisms were obtained in four cases and that, whenever identified, the *S. salivarius* predominated.

We have now completed Section I, and can summarize the main points as follows:—

(1) The term "dental sepsis" implies infection of the periodontal membrane, either *externally* via the gingival trough, or *internally* via the apical foramen.

[1] "Bacteriology of Dental Pulp," C. J. Kelsey. Printed in *British Dental Journal*, September 15, 1920.

(2) The organisms are mainly the viridans group of non-hæmolytic streptococci, the predominating species being *S. salivarius*.

(3) In every tooth affected, the infection involves both periodontal membrane and alveolus, because of the anatomical relationship.

(4) The infected tissues are invisible, and the condition may be present for long periods without necessarily causing any local symptom.

(5) Dental sepsis is either *open*, as in pyorrhœa alveolaris, where there is an obvious free discharge of pus from the surface, *or latent*, as in all periapical conditions, where there is direct absorption of toxins generally via the lymphatics and often without any external sign.

(6) *Pyorrhœa* starts as a marginal gingivitis involving many teeth; it is a slow progressive destruction of the tooth socket and involves four tissues, viz., gum, bone, periodontal membrane and tooth, from each of which there is discharge of septic products.

(7) Though there is a free discharge of pus from the gum margin, it must be borne in mind that there is an extensive volume of infected bone, many times larger than that of the affected roots, from which there is active absorption of toxic products.

(8) As regards the *latent* sepsis, *the most potent* is that following the conservation of putrid teeth, many of which are crowned, after root treatment.

SECTION II.—SUBDIVISION (A).

What are the Factors governing the Systemic Effects?

These will be considered under the following headings:—

(1) Virulence of the organisms, i.e., the intensity of attack.
(2) Volume of toxins absorbed, i.e., the extent of attack.
(3) The "time factor," i.e., the duration of attack.
(4) The patient's resistance, i.e., the defence.

(1) *Virulence of the Organisms.*

Just as in other pathological infections, diphtheria for example, a small lesion may produce very severe effects if the organism is virulent, an extensive lesion with an organism of low virulence may give rise to little constitutional disturbance.

As an example, a fatal infective endocarditis following periapical infection of a lower central incisor has been recorded. This tooth is the smallest in the mouth, and its periodontal membrane has an area about two-thirds that of the incisor shown in fig. 4 (p. 171). The radiogram indicated that only the apical portion of membrane and alveolus was infected. On culture this tooth gave streptococci identical in character with those found in blood-culture.

It is possible that streptococci gaining access to damaged tissue acquire an increased virulence.

Rosenow's[1] observations (1915, 1919, 1921) must here be mentioned. The older theory of focal infection was that the factor which determined the systemic localization of circulating bacteria was essentially a lowering of resistance in the focal tissues by previous injury. An example often quoted is the acute osteomyelitis of a child's tibia following slight injury.

Rosenow's remarkable researches and experiments, though by no means generally accepted, throw a flood of new light on the question. Briefly, he maintains that streptococci and also other organisms have a "most striking affinity or tropism for the organs or tissues from which they are isolated." He claims to have discovered that it is in the focus of infection that changes occur and the different affinities for various structures are acquired. The focus of infection is both the place of entrance and the place where organisms acquire peculiar properties to infect other areas throughout the body. In typhoid fever the blood is invaded by the typhoid bacillus which, however, shows greatest affinity for intestinal lymphoid tissue. Pneumococci enter the blood in all cases of lobar pneumonia, yet lesions are usually limited to lungs and pleuræ. In chronic septic endocarditis streptococci have been isolated from the blood daily for weeks and months, but localization remains limited to the endocardium. In infectious diseases the properties of specific micro-organisms determine their localization.

Rosenow's demonstrations go to show that the streptococci of low virulence found in dental lesions have this elective localizing power. If he is correct, it follows that dental sepsis must be given a place of supreme importance as the most widespread source of hæmatogenous infection of the present day.

It is generally thought that the main organisms in the great majority of dental lesions belong to the viridans group, and have low virulence. The hæmolytic group is rare and its presence is of great significance.

(2) *The Volume of Toxins absorbed.*

Dental sepsis involves three main structures, viz., gingival trough, periodontal membrane, bone. Their surface areas have been indicated, and it must again be emphasized that the terms "dental sepsis" and "oral sepsis" give a totally wrong impression of the pathological picture. They concentrate attention on the external and superficial. The term "jaw-infection" has been suggested as a better one, which would at once imply deep and hidden pathological changes in the structures surrounding the tooth.

The greater the number of teeth involved, the greater the volume of toxic products absorbed. In this connexion it must be remembered that the molars present a much greater root surface than the anterior teeth, and

[1] E. C. Rosenow, *Journal of American Medical Association* (1915) and *Journal of National Dental Association*, 1919, 1921.

a reference to fig. 4 will indicate that the periodontal membrane area of a three-rooted upper molar is roughly three times that of an incisor, and a two-rooted lower molar is twice as large as an incisor. The estimation of the volume of infected bone is one of the most important and difficult tasks of the dental surgeon. Here we may indicate the clinical examination required for this estimation.

The patient should be examined in the dental chair before a good light. It is impossible to examine the mouth of a bed patient in the wards with any degree of accuracy. Every tooth must be examined separately by every possible test to determine the presence or absence of any pathological change in its gum, gingival trough, periodontal membrane, pulp, alveolus and bone of jaw. The condition of each tooth is noted on a chart and special attention paid to those which have received any conservative treatment whatsoever. Every crowned tooth—collar or flush—is condemned at once (remember, our patient has definite systemic disease, and we are eliminating actual and potential foci of infection). We are not looking for superficial caries but for internal sepsis. If a tooth is carious and the pulp infected, or still alive but the crown so greatly destroyed as to render it beyond conservation as carried out in Army practice, it is condemned at once.

It is not intended to describe the clinical examination of the teeth in greater detail, but the mouth as a whole must be examined also, and the condition of the following noted: area of palate, mucous membrane of cheek, lips, tongue, floor of mouth, tonsils, preauricular, submaxillary, submental and cervical lymphatic glands. If a denture is worn, the area of palate and gum covered must be examined. In short, a thorough clinical examination, carried out in this manner by the dental officer who is fortunate enough to have an X-ray department available, should not miss a single point of importance.

The odontogram is of immense importance, and its supreme value does not lie in the detection of those obvious periapical bone changes which the clinical examination has presupposed, but essentially in the estimation of their *depth and lateral extent.* We must suppose a zone of definitely infected bone which will be obvious in the film, surrounded by a zone of partially infected bone in which some attempt is made to limit the infection. This zone will not be so obvious, and indeed may escape detection. Lastly, there is a gradual shading off from the periphery of this zone into what may be regarded as normal tissue. It is the definition of this junction of sound, and more or less unsound, bone which is the most important and most difficult task of the radiologist, and at the same time one of supreme value to the dental surgeon. If he knows the depth of infected bone, his knowledge of the anatomy of the parts will enable him to gauge with some accuracy the extent in three dimensions of the tissue involved in any given lesion.

While the exact definition between sound and infected tissue is difficult

enough in these localized conditions due to periapical infection, the difficulty in extensive pyorrhœa is much greater, for here the whole alveolus and bone of jaw are involved. While the interpretation of odontograms and the conditions they indicate are beyond the scope of this paper, it must be stressed that the ideal dental examination presupposes odontograms of all the teeth in the mouth.

With all the data before him (chart, radiograms, radiologist's report and patient), the dental officer should be in a position to estimate the surface area and volume of the various tissues affected.

(3) *The Time-Factor.*

The importance of this must be stressed, for obviously the longer the toxin dosage is kept up the greater will be its effects.

Dental sepsis causing any constitutional symptom must be present for at least a period sufficiently long to allow the absorbed toxic products to circulate, elect their site of location, and produce those pathological changes in the focus selected in sufficient quantity to bring about that impairment of function of which the constitutional symptom is an expression.

Pyorrhœa is essentially a chronic disease, starting in early adult life, and many years may elapse before its classical symptoms are obvious. While the virulence of the organisms is low, the great extent of infected tissue caused by it and its marked chronicity produce the most *widespread* constitutional symptoms by virtue of the volume and duration of the toxin dosage.

Again, in latent dental sepsis, one frequently sees crowned and root-filled teeth which were conserved fifteen or twenty and more years previously and which, to the medical officer and patient, are "all right," though clinically and radiologically there is ample evidence of long-standing pathological changes. Here we must suppose a much reduced toxin dosage, but it is of greater concentration because there is no dilution by saliva, as in pyorrhœa, but direct lymphatic absorption.

The limited bacteriological results previously reported in Group II (latent sepsis) indicate infection by a limited variety of streptococci, and recent research tends to show that they are of greater virulence than in open sepsis. This increased toxicity, together with higher concentration of the toxin dosage over a long period, produces the most severe constitutional symptoms. While only one such infected tooth may be present, it is usual to find three or four and sometimes a large number in the sick patient, and when it is remembered that they frequently cause no apparent local sign or symptom, their great significance cannot be exaggerated.

(4) *The Patient's Resistance.*

The importance of this factor will be readily appreciated.

"In a person in apparent health in whom slight dental sepsis is present the toxic substances produced by the streptococci must be neutralized by

the body fluids, and the organisms must be ingested and destroyed by the leucocytes. It is the unneutralized toxic substance and possibly also the organisms themselves which cause by absorption the effects of dental sepsis in the sick person." [1]

We are dealing in the Army with patients who are presumably physically fit in every sense and whose resistance is at a maximum. Dental sepsis may be present and the toxic substances neutralized, but any lowering of the body defences by diseases will adversely affect the balance and a "vicious circle" may be induced in which the effects of the dental sepsis will increase the constitutional symptoms. In such vicious circles it is frequently noted that the systemic disease does not disappear entirely on treatment, but only reaches a certain stage of recovery, and the subsequent removal of the dental condition often brings about a rapid, and sometimes a surprisingly dramatic, complete recovery.

Some cases illustrating this point will be given in the next section.

It is the varying inter-relations of these four factors which determine the resulting systemic lesion, and they may be expressed in the following disease equation :—

$$\frac{\text{Virulence} + \text{toxin dosage} + \text{time factor}}{\text{resistance}} = \text{systemic effects.}$$

SECTION II.—SUBDIVISION (B).

What are the Systemic Effects Produced?

The conditions *associated* with or *influenced* by dental sepsis may be tabulated as follows [2] :—

(1) *Mouth and associated parts*: Pharyngitis ; laryngitis ; squamous-celled carcinoma ; chronic superficial glossitis ; progressive enlargement of jaws, myeloma ; lymphadenitis.

(2) *Gastro-intestinal*: Chronic gastritis ; gastric ulcer ; gastric carcinoma ; duodenitis ; pancreatitis ; sprue.

(3) *General malnutrition* : "General debility."

(4) *Gland secretions*: Deficient lactation ; deficient secretion of the ductless glands.

(5) *Chronic rheumatism.*

(6) *Chronic arthritis* : (*a*) Rheumatoid ; (*b*) osteo arthritis.

(7) *Anæmia* : Chlorosis ; septic anæmia (Hunter) ; pernicious anæmia.

(8) *Skin* : Purpura ; erythema multiforme ; lupus erythematosus ; eczematous dermatitis ; acne rosacea ; boils ; alopecia areata.

(9) *Nervous system* : Neurasthenia ; mental affections.

(10) *Cardio-vascular system*: Dry pericarditis ; aortic regurgitation ; arterio-sclerosis ; infective endocarditis ; cardiac irregularity.

---

[1] Sir W. Willcox, Dental Board of the United Kingdom Lectures, "Systemic Effects," 1923.

[2] Condensed from J. F. Colyer's "Dental Surgery and Pathology," pp. 684-706.

(11) *The eye* : Inflammatory conditions of iris; ciliary body and choroid.
(12) *The ear* : Deafness and tinnitus (the membranes being normal).
(13) *General infection* : Toxæmia.
(14) *Intermittent fever* : Subacute septicæmia.
(15) *Cancer.*
(16) Affections of nose and accessory sinuses; antrum, etc.
(17) Neuralgias.

It is a formidable list, but in the main the various lesions with which dental sepsis is associated may be differentiated into three chief groups, according to the paths of infection from the jaws, and I propose here to consider them from this standpoint and to illustrate each group by cases I have treated.

Differentiation of Systemic Effects according to Path of Infection.

(1) Those resulting from lymphatic absorption.
(2) Those resulting from alimentary absorption.
(3) Those resulting from direct extension.

Group I.—Cases Illustrating the Lymphatic Absorption.

In all cases of latent dental sepsis the toxic products are absorbed directly by the lymphatics of the periodontal membrane and the medullary spaces of alveolus and bone of jaw. This absorption of toxins into the circulation brings about those remote conditions which to the physician are so difficult to correlate with dental conditions producing no apparent sign or symptom in the mouth.

At the International Dental Congress in 1914, Sir Rickman Godlee, speaking on toxæmia of oral origin, said, " Of the two ways the system may be poisoned (the other was pyorrhœa), I believe that the absorption of septic products by abscesses and sinus walls is out and away the more important."

The following cases are selected as illustrating the connexion between systemic lesion and dental condition and are essentially cases of *latent* dental sepsis.

To shorten the description, the thirty-two teeth are designated by the following notation :—

$$\text{Right}\ \begin{array}{r|l} 87654321 & 12345678 \\ \hline 87654321 & 12345678 \end{array}\ \text{Left}$$

1 = central incisors 2 = lateral incisors 3 = canines
4 = first bicuspids 5 = second bicuspids
6, 7, 8 = first, second and third molars respectively
Thus $\overline{6|}$ = lower right first molar ; $\underline{|5}$ = upper left second bicuspid.

Case 1.—Major B., aged 46.

Condition.—Lupus erythematosus ; extensive.

History.—September, 1918, was bitten in the face while serving in Bulgaria by mosquitoes and sandflies. Much swelling resulted ; the skin broke down in parts; scabs formed and healing was only partial. This

condition continued and ultimately spread to the whole area from the lower border of mandible to forehead, the worst spots being the sides of the nose, temples and eyebrows. Boarded in England, 1921, and given seven months' sick leave, during which various treatments were tried without result, and he returned to duty with B.A.O.R., Cologne. In March, 1924, an acute inflammatory condition developed with considerable discharge. Scrapings gave *Staphylococcus albus*, and an autogenous vaccine was prepared and administered, resulting in cure of this superimposed condition only.

He was transferred to Millbank on April 19, 1924, presenting a typical and extensive butterfly distribution.

Examined by Captain Doble, Dermatologist, on 20th, brought in for dental examination at once, and the dental condition was as follows :—

Teeth standing: $\begin{array}{r|l} 1 & 12345\ \ 8 \\ \hline 87\ \ 4321 & 123 \end{array}$

Of these $\begin{array}{r|l} & 458 \\ \hline 874 & \end{array}$ had gold crowns with marked local pathological changes; $\underline{1 | 12}$ had received root treatment and were discoloured; and the lower incisors, though not exhibiting well-marked pyorrhœa, were involved in a marginal gingivitis.

The clinical condition suggested long-standing latent sepsis, four of the gold crowns having been in position for twelve years.

Radiograms showed extensive bone infection under all teeth which had received treatment, and especially a marked osteo-porosis under $\begin{array}{r|l} & 8 \\ \hline 87 & \end{array}$. The gaps were replaced by dentures. All the teeth were at once condemned, and a vaccine being considered advisable, due precautions were taken to limit contamination. The sixteen teeth were removed under local anæsthetic in four successive days, and at once the patient was conscious of a change in his condition. This change was most rapid and was maintained without remission. Indeed, to the patient, whose condition for six years had been most distressing and causing him to shun society, it was astonishing. So rapid was the clearance that Captain Doble discharged him to duty on May 17, 1924, the total days in hospital being twenty-eight.

The vaccine was prepared (the organisms being *S. salivarius, S. mitis* and *S. ignavus*) but never used. On October 2, 1924, the Dermatologist, Cologne, wrote that improvement was maintained and that his skin was clear except over nose and eyebrows. On examination in August, 1925, the whole condition had disappeared.

This case is recorded in detail as it brings out many points :—

(*a*) During the six years' duration of the case the dental condition was never examined or suspected.

(*b*) Complete removal of dental sepsis produced rapid improvement and complete cure.

(*c*) That the elimination of the dental sepsis in the earliest stages of the disease would probably have profoundly affected its course.

(*d*) No other treatment whatever was given during the twenty-eight days in hospital.

Case 2.—Gunner C., aged 23.

Condition.—Lupus erythematosus, four months' duration, extensive but not nearly so marked as in Case 1.

Dental Condition.—Teeth standing: $\text{Right}\ \begin{array}{r|l} 7654321 & 1234567 \\ \hline 54321 & 12345\ \ 8 \end{array}\ \text{Left}$

No caries; no fillings; no crowns.

Marked pyorrhœa of "dry variety," i.e., very little or no pus on pressure, involving nearly all the teeth and most marked round the incisors and bicuspids.

Extensive extractions were done, and four teeth selected from different regions sent for preparation of vaccine. In each case the *S. mitis* was found in almost pure culture, and the teeth, instead of showing translucency of apices, showed absorption.

Result.—Slow but continued improvement, starting round lower border of mandible and working upwards, leaving clear new skin. After two months, considerably cleared except round nose, temples and eyebrows, and the vaccine was then administered, which hastened clearance. Patient returned to duty and later transferred to another Command. Last report, eight months later, was that the lupus had almost entirely cleared from the face, small patches being localized over the eyebrows.

As an indication of family predisposition, it is interesting to note that this patient's twin brother, who was not a soldier, also developed a similar condition two years previously.

Note.—(1) Great extent of pyorrhœa, even at age 23.

(2) Practically pure culture of organism (*S. mitis*).

(3) Practically no free pus, but marked absorption of toxins from infected periodontal membranes in apical region.

Case 3.—Sergeant —, wearing upper denture of seven teeth, reported to have it repaired. It was noticed that the whole area of the palate covered by the plate was markedly inflamed, due to the patient never taking it out at night and not keeping it scrupulously clean. At the same time an early lupus erythematosus was noticed, confined to an area the size of a postage stamp, on each side of the nose, and a small patch on each temple. Dermatologist attributed the lupus to the palate condition and the denture was purposely not replaced to test this, and the patient instructed to keep his mouth scrupulously clean.

Result.—In two weeks the patches were smaller and in five weeks had disappeared entirely. No other treatment meanwhile.

Note.—Causal relationship is probably explained by the passage of streptococci from the saliva under the denture through the inflamed and weakened mucous membrane; their location in the submucous tissue and bone; and the toxin absorption from them.

Case 4.—Captain H., aged 30. Admitted September 24, 1923.

Condition.—Chronic dermatitis, lower lip, about one square inch in area.

No evidence of leishmaniasis in scrapings; no malarial parasites in blood.

Treated by arc light (two exposures) with considerable improvement, but the dermatitis did not clear. Scrapings gave *S. aureus*; vaccine prepared and administered first on October 29, 1923. Slow improvement but some dermatitis still present. Passed for dental report.

Dental Condition.—All teeth sound except $\underline{21|}$ which were somewhat discoloured and had large porcelain fillings suggesting root treatment. No external evidence of abnormality. Radiograms showed $\underline{2|}$ with a root filling pushed through its apex and much periapical bone necrosis; and $\underline{1|}$ with marked absorption of root and similar periapical condition.

The teeth were extracted on November 5, 1923, and there was a striking change in the lip condition, which healed up entirely within two weeks, the patient being discharged on November 23, 1923.

Note.—(*a*) A clear illustration of a "vicious circle."

(*b*) The small area of infected dental tissue.

(*c*) The necessity of dental examination when there is any cessation in the recovery of a lesion, which may be due to a superadded dental infection.

(*d*) The extreme importance of the odontogram.

Case 5.—Colonel C., aged 50. Admitted March 25, 1924.

Condition.—Phlebitis in right leg; left leg œdematous and popliteal and external saphenous veins thrombosed.

X-ray report, no abnormality in thorax. *No discoverable cause.*

Sent for dental report on April 4, 1924.

Dental Condition.—Teeth extracted: $\begin{array}{r|l} 54\ 21 & 12\ \ 5 \\ \hline & 5\ 7 \end{array}$

$\begin{array}{r|l} 41 & 125 \\ \hline & 7 \end{array}$ were crowned and the rest had root fillings. In view of the condition, extractions were done singly and completed on April 30, 1924. All teeth, especially crowns, were obviously chronically infected.

General Treatment.—Rest and subsequent massage.

Result.—Slow improvement at first and then more rapid. May 25, 1924, walked across room for first time; no ill effects. Improvement maintained and patient was able to walk a fair distance, and discharged for convalescence on June 13, 1924. Returned four months later physically fit.

Note.—(*a*) Most of the crowns had been in the mouth over fifteen years.

(*b*) While all above teeth were obviously pathological to the dental officer, the patient had never experienced any discomfort.

Case 6.—Lieutenant Y. Admitted November 15, 1923.

Condition.—(*a*) *Chronic rheumatism both knees*, following rheumatic fever. (*b*) *Subacute iritis* left eye; right eye normal.

Left eye first affected 1916, and again August, 1923.

Had received private dental treatment in 1923, eliminating sepsis in upper jaw but lower jaw not treated.

No trace of gonorrhœa.

Dental Condition.—Few upper teeth left and these quite sound. Lower teeth standing: $\overline{87654321 \mid 12345\ 78}$

No crowns. $\overline{5 \mid 5}$ were septic under root filling and $\overline{876\ 4 \mid 4}$ were septic as a result of caries and showed marked bone infection. These teeth were extracted and three specimens sent for preparation of vaccine. Not identified hæmolytic and non-hæmolytic streptococci were found.

First injection of 0·1 c.c. of vaccine on December 21, 1923, followed by marked reaction in eye and knees.

General treatment was carried out for knees and eye, and he was discharged on April 15, 1924, on sick leave with eye and right knee cured; left knee very much better.

It was considered that elimination of dental sepsis and vaccine therapy helped considerably in the treatment.

Note.—(*a*) Presence of hæmolytic streptococcus.

(*b*) Reaction to vaccine.

(*c*) The vicious circle.

(*d*) On return for medical board after sick leave, found fit in every respect.

Case 7.—Sister, Miss A.

Condition.—Chronic arthritis of cervical vertebræ, many years standing. Lateral movements painful and increasing difficulty in flexion and extension of neck.

Of teeth standing $\underline{21 \mid 12}$ were flush-crowned fifteen years ago, and there was no sinus on gum, no pus on pressure, no loosening. Gum (over apices) showed marked congestion and the finger could feel that marked absorption of roots had taken place. $\underline{\mid 4}$ was loose as a result of overstrain in biting and obviously infected.

Radiograms showed no dark shadows above crowns, the bone filling up the space originally occupied by absorbed root.

All five extracted and showed extensive changes. No vaccine was prepared.

Results, in order of sequence: (*a*) Gradual decrease in pain. (*b*) Gradual increase in freedom of lateral movements. (*c*) Gradual increase in freedom of up and down movements.

Condition three months afterwards, no pain and only slight limitation of movement in each direction.

Case 8.—Staff Nurse, Miss B.

Condition.—Neuritis, right shoulder, commencing 1915 and gradually becoming worse.

Dental Condition.—Mouth particularly clean and all teeth sound except two, which had received root treatment, and though broken down to gum

level had been restored by flush crowns fitted to a cast gold base, ensuring great accuracy of adjustment. A conscientious attempt had been made to avoid any ledge or injury to gingival trough.

These teeth $\underline{|6}$ and $\overline{5|}$ were strongly suspected, radiographed, and proved to be definitely infected, the $\underline{|6}$ specially showing bone infection round each root. Both were extracted and an abscess sac was attached to each of the three roots of $\underline{|6}$.

Result.—Decrease in pain noticed five days after and maintained till shoulder was normal. Reports that occasionally there is a slight "twinge" in winter.

Case 9.—Captain W., Indian Army.

Condition.—Neuritis, right arm, starting in India and first noticed when drawing sword from scabbard. Increased in severity. During leave patient came to Millbank and had three weeks' massage and electrical treatment, with no marked improvement.

Sent for dental report.

Condition.—All teeth sound except $\underline{4|}$, which was collar-crowned and obviously septic and loose. This was extracted at once and patient left hospital following day.

Result.—Reported on his own accord four months later that though he had no further treatment the arm had recovered absolutely. He could play tennis and wind up his car, and there was no decrease in muscular tone.

Note.—This somewhat unexpected result may have been due to increased virulence of organisms. The tooth was not examined bacteriologically, but was very foul both externally and internally and showed marked absorption.

Case 10.—Major S., aged 42.

Condition.—"Toxic heart," following severe pneumonia. No organic change in heart muscle.

Dental Condition.—Many crowns; several root-filled teeth showing periapical infection and remainder (about seven) involved in pyorrhœa. Extraction of all teeth in the mouth was necessary and, in view of condition, three were extracted singly, a vaccine was prepared and administered as a desensitizing measure and, because of pressure of time, the remainder were extracted in one sweep under ether.

Result.—Eight weeks later examined and found free of heart symptoms.

Note.—Another case of "vicious circle," the dental sepsis having been of long duration before the attack of pneumonia.

Case 11.—Pte. W., aged 21. Admitted August 25, 1923.

Condition.—(*a*) Marked tachycardia, 132 per minute, and myocardial irritability. A soft systolic murmur audible over whole precordial area. (*b*) Adenitis, right side of neck swollen, red and tender. (*c*) Low irregular pyrexia.

Dental Treatment.—Strict rest in bed, etc., and as soon as his condition allowed he was carried to dental centre, where it was found that $\frac{7654}{654}\Big|$ were

broken-down septic roots, responsible for adenitis, if nothing else. All teeth extracted on two consecutive days.

Result.—Heart rapidly settled down; exercises were gradually increased till exercise tolerance was almost normal, and he was discharged as cured on October 4, 1923.

Case 12.—Colonel J., aged 52. Admitted May 1, 1923.

Condition.—Early arthritis, left hip, with pain on movement, gradually increasing. Otherwise perfectly fit.

Dental Report.—Teeth standing: All uppers except and $\begin{array}{r|l} 3 & \\ \hline 76\ 4321 & 123\ 56\ 8 \end{array}$

No crowns; no fillings; gums normal; no caries; teeth yellow and hard. Teeth show marked attrition due to grinding movements in mastication. Clinical examination revealed slight tenderness on $\overline{|\,56}$ on percussion, probably due to excessive biting strain, which caused a chronic periodontitis, and it was presumed that they would show either productive or rarefactive changes. Radiograms revealed considerable cementosis, each root showing a smooth and very bulbous outline, suggesting a long-standing condition. There was no apparent bone infection, as suggested by the usual dark areas, but a general sclerosis round these teeth. Extraction presented great difficulties in view of deposit on apex, and as it was desirable to obtain a vaccine $\overline{|\,56}$ were isolated and kept sterile, as previously described. After local injection, gum was raised from bone in one large flap, external alveolar plate and bone between teeth removed by burring; the slight hæmorrhage stopped by adrenalin, and both teeth shelled out cleanly and at once forwarded to laboratory for preparation of vaccine. Aseptic measures were adopted throughout. Both teeth revealed the same organisms, *S. salivarius*, *S. fæcalis* and *S. mitis* from which a vaccine was prepared. Probably during the surgical removal each contaminated the other.

Result.—General reaction to first injection of 0·1 cubic centimetre of vaccine; with exacerbation of pain in left hip. Slighter reactions to second; none to remainder. Diminution of pain in joint and increased mobility.

End Result.—Complete disappearance of pain and no further apparent increase in joint lesion, cure of which was not possible owing to permanent pathological changes in it.

Note.—(1) A typical case of the "gouty type" in which the rule is hard, yellow teeth showing marked attrition due to good grinding, with cementosis of a smooth and regular character and sclerosis of bone instead of porosis.

(2) Small number of teeth involved, the only apparent pathological change being the cementosis.

(3) Exacerbation, followed by improvement by vaccine therapy.

(4) Such a condition may involve all or a large number of teeth without causing any external evidence in the mouth, and is intimately connected with extensive and severe arthritic changes,

Case 13.—Lieutenant E., Indian Army, aged 28. Admitted January 10, 1924.

Condition.—Invalided from India with marked neurasthenia and neuritis, both arms. No discoverable cause.

Dental Report.—All teeth sound except $\underline{41|12}$ which were filled and showed obvious external and radiographic evidence of extensive periapical infection with imperfect root fillings, particularly $\underline{1|1}$.

General Treatment.—Routine for neurasthenia, which improved slowly, and massage and electric treatment for arms. Latter was discontinued after extractions to note improvement, if any.

Result, as reported by medical officer, "Rapid and maintained improvement in neuritis and a marked reduction in neurasthenic symptoms." General treatment was confined to tonics, and eight weeks after last extraction all neuritis had disappeared. Patient sent on sick leave (three months), and on medical board found fit.

Note.—(*a*) Neurasthenia is quite a common symptom of the "dental sepsis complex," and is frequently and rapidly benefited by removal of infected teeth.

(*b*) $\underline{|1}$ had been severely injured by blow at age 15; received prolonged treatment and eventually was root-filled and conserved. It was markedly discoloured, showed marked absorption of root and extensive infection of surrounding bone. It is becoming increasingly recognized that such teeth subjected to trauma frequently have extensive periapical bone infection without external evidence, and it is presumed that, as many instances have occurred in which such teeth are intimately connected with severe systemic lesions such as infective endocarditis (as in the case recorded under "virulence"), the organisms have a high virulence, and Rosenow's "elective localization" theory may account for this.

(*c*) Such teeth subjected to trauma are usually found among incisors and canines, because of their exposed positions.

(*d*) The most dangerous variety is the slightly discoloured tooth which has not received any filling and may easily escape detection in clinical examination, though odontograms at once show extensive infection.

Case 14.—Corporal H., aged 27.

Condition.—Abscess, right groin. Opened, drained, but did not close entirely. Chronic discharge.

Reopened, drained and again did not close up.

Patient complained of "sore gums," was sent for dental report.

Dental Report.—(*a*) Acute ulcerative gingivitis of Vincent type (specific infection by symbiotic *Bacillus fusiformis* + Vincent's spirillum) round erupting $\overline{8|}$, with large ulcer on cheek. (*b*) $\frac{65}{65}\Big|$ with putrid or necrotic pulps as a result of caries.

Treatment.—Gum condition first treated and brought under control in four days; $\overline{65|}$ removed on fifth day. Medical officer dressing the groin

sinus noticed diminution in discharge. $\underline{65|}$ removed on sixth day. Medical officer reported on eighth day considerable reduction in discharge and also decrease in opening of sinus; maintained till fourteenth day when no discharge whatever and much smaller sinus, which eventually closed on sixteenth day. No recurrence.

Note.—(*a*) A clear case of "vicious circle."

(*b*) This case is one of many such, in which elimination of such a focus of streptococcal infection in the mouth results in rapid healing of a wound, either operative or gun-shot. It was frequently noticed during the war in fractures and gun-shot wounds of jaws that union of fragments was delayed until all roots, infected or injured teeth, minute sequestra and particles of shrapnel were removed from the site of injury.

(*To be continued.*)

NOTES ON THE RE-EXAMINATION OF RECRUITS.

By Captain S. SMITH.
Royal Army Medical Corps.

Until comparatively recently (January, 1923) the only systematic medical examination undergone by the recruit was that carried out by the medical officer at the recruiting centre on first enlistment.

Recently a second or re-examination was ordered to be carried out within twenty-four hours of the recruit's arrival at his depot.

This innovation was introduced primarily because of the expense to which the country had hitherto been put as a result of the too frequent discharges (on Army Form B. 204) of recruits during their first six months of training for disabilities occurring prior to enlistment and which should have been (and would have been in a perfect world) found out at the primary medical examination on enlistment. It also ensures that the officer in medical charge of the depot is made aware of the exact physical condition of the recruits under his medical charge and is thus able efficiently to supervise their training.

The second examination follows the same general lines as the first primary examination (as laid down in Regulations for the Medical Services of the Army, Appendix No. 11 *B*) and is made by the officer in medical charge of the depot to which the recruit is sent.

The procedure followed at this station, where there is a cavalry and an infantry depot, is briefly as follows :—

Every recruit is carefully and fully medically examined the morning after arrival in the station, the full examination in each case taking about ten minutes.

If found *fit* or only suffering from some minor disability not necessitating discharge, the fact is entered in Table VI of his Medical History Sheet and he is returned to the depot to commence his training.

If considered *unfit* the following procedure is carried out :—

The examining medical officer first shows the case to his senior medical officer, and if the latter agrees that the recruit should be discharged he is sent to the appropriate specialist (medical, surgical, eye, ear, nose and throat, etc.). If the specialist concurs the case is then submitted to the D.A.D.H. who, acting for the A.D.M.S., gives the final decision. If the latter officer, who has the final say in the matter, after weighing up all the evidence for and against, also concurs with the previous findings he orders immediate discharge of the recruit. If the medical examination has taken place prior to final approval (in the case of the cavalry) the man is returned to the recruiting centre, where he was enlisted, for discharge without further formality, under para. 50 Recruiting Regulations. If the man has been approved (most of the infantry recruits are finally approved before joining the depot) the discharge is carried out on Army Form B. 204.

On the other hand, the A.D.M.S. may order the recruit to continue with his training, being kept under observation and brought up before the D.A.D.H. at his monthly inspections, periodic progress reports being submitted to the office of the A.D.M.S.

By this means the Army is saved the expense which formerly occurred of having to discharge a recruit after perhaps several months' expensive training on account of a disability with which he should never have been enlisted. The recruit often gains to this extent, that he is less unsettled than he would be had he been discharged after a period of army life and in many cases has been able to return to his previous employment.

I have heard the principle of medical re-examination "crabbed" by keen recruiting officers for the reason (although one suspects this is not their sole ground of complaint) that in principle it puts one medical officer up against another, and while to a certain extent this is true and inevitable, if one remembers that the recruit runs the gauntlet of a fairly thorough examination by at least three medical officers, amounting in effect to a medical board, before final discharge, there is less cause for complaint.

I have only gradually evolved a certain amount of method out of the primary confusion of ideas, concerning exactly what defects should determine discharge, and as a result of my experience maintain that a medical officer in daily touch with recruits at a depot, constantly confronted, as he is, with inefficients from one cause or another at his morning sick parade or in the gymnasium, is, or should soon become moderately expert in weighing up the probable effect of any given disability on a soldier's future military efficiency.

It would appear that for this reason alone the re-examination by him of all recruits joining the depot may be said to be justified. In addition the M.O. at the depot is thus given the opportunity of at least one complete and detailed examination of each recruit during his period of training; any departure from the normal may be noted down in a book kept specially for the purpose and his progress under training subsequently checked. In other words, it gives the M.O. a valuable "base-line" for further observations. Hard and fast routine with a definite sequence of tests, nothing being omitted, is an absolute *sine qua non* in any systematic examination of recruits, and as this re-examination is as it were a second or more refined weeding out than is the primary examination, a slight variation in the tests laid down in the Regulations for the Medical Services of the Army is advisable, a slightly different view-point being thus obtained.

In the first place it is absolutely essential that the recruit be entirely stripped, and in order to enable the examination to be carried out in comfort and without danger to him, the room must be suitably warmed (i.e., considerably above the temperature considered sufficient in an ordinary M.I. room). Efficient lighting is also necessary.

(1) *The recruit is examined standing in the middle of the room with his feet slightly apart and arms by his side.* The examining officer

walks completely round him noting any obvious defects, i.e., scoliosis, kyphosis, knock-knee, pes cavus, flat feet, varicose veins, etc., etc. If any spinal defect be present the usual bending exercises should be carried out.

Any defects are immediately noted down and *not* left until the end of the examination, by which time they may be forgotten.

This preliminary survey is most important, and is very liable to be scamped or omitted if one is in a hurry.

It must often be omitted also at the primary examination on enlistment, as one is frequently confronted with severe cases of knock-knee, varicose veins, flat feet, etc., when no mention of these disabilities is made on the recruit's Medical History Sheet.

One recruit had a meningocele of the head almost as large as a melon which prevented him wearing his hat properly, no mention of this somewhat severe defect appearing on his Medical History Sheet.

(2) *The recruit now stands to attention with the two feet in apposition along their inner margins.* Cases of knock-knee at once become apparent, the recruit with this deformity usually standing with both knees in close apposition, one knee being slightly bent and on a slightly anterior plane to the other.

The "quantitative" test for knock-knee described by Lieutenant-Colonels Cowey and Sylvester Bradley in a recent article on recruiting and incorporated in a recent amendment to Regs. A.M.S., Appendix XI, B, should always be employed when knock-knee exists. This consists of making the recruit sit on a chair and extend his legs straight before him with the inner borders of the knees just touching; the distance between the internal malleoli (which should not be more than two inches) is then measured and recorded on his Medical History Sheet. The record is useful for future observations.

(3) *From this position and without separating the feet, the recruit stands on tip-toe and then bends slowly down on his knees until they touch the ground in front of him.* His body should be erect and his hands on his hips as he slowly assumes a kneeling position. Then without the assistance of his hands he springs upwards and backwards to his original position of attention. This is an important test for the discovery of hallux rigidus, a most disabling condition when severe. During my first months at the depots hallux rigidus was little more than a name to me, and it was only after some months' contact with recruits attempting to carry on with this very real disability, especially so for an infantry soldier, that its importance was realized.

The test detailed above was first shown me by Major A. N. Fraser, D.S.O., M.C., R.A.M.C., late D.A.D.H., Home Counties Area, and most helpful it is. If the test is properly performed, as the recruit comes slowly forward to the kneeling position the feet must be kept in close apposition and both great toes should be acutely dorsiflexed when the knees have reached the ground.

The commonest cause of failure is, as noted above, hallux rigidus, in severe degrees of which the recruit will topple forward on his knees, being quite unable to tuck his toes under him as he bends down, nor will he be able to jump back to the standing from the kneeling position without the assistance of his hands. He may attempt to overcome the difficulty by externally rotating and separating the feet as he comes down, his weight thus being borne on the inner margins of the feet instead of on the balls of the feet and toes. This method of evasion should be watched for and prevented by ensuring that the inner borders of the feet are kept in apposition.

Some perform the test badly owing simply to lack of the sense of balance, having apparently no power to keep the body erect as they come down. In a certain number of cases hallux rigidus, due to stiffness of the metatarso-phalangeal joint, may be compensated for by undue flexibility at the first interphalangeal joint. These cases usually do well under training and should not be discharged.

In cases of severe hallux rigidus there is usually some history of injury, often the falling of a heavy weight on the toes, but the condition may be congenital. Examination often reveals a considerably enlarged joint, with bony overgrowth and lipping of the head of the first metatarsal bone; a bunion is also commonly present. Cases with obvious signs such as these should be discharged.

A year ago, cases of severe hallux rigidus were constantly being sent up and a considerable number had to be discharged, but I have not seen a genuine case for many months now.

One important reason for the initial careful test for this condition is that many recruits develop a more or less spurious stiff great toe during training, and unless one can be sure that a careful primary examination was made one is apt to be taken in.

(4) *The recruit hops round the room first on the right and then on the left foot.* The individual hops should be small and the weight carried on the ball of the foot and toes. This test will often reveal the presence of painful corns on the balls of the feet and under-aspects of the toes, and is also an additional test for hallux rigidus and enables one to determine the degree of flexibility of the plantar arch in cases of flat feet.

(5) *The recruit stands on tip-toe and then springs up from this position, bending his knees acutely and bringing his feet up under his buttocks as he jumps, alighting again on tip-toe.* This tests the power of flexion and mobility of both knee and hip-joints and is awkwardly performed by those with stiff knees.

(6) *The recruit stands on tip-toe and then springs up from the ground, separating his legs as he springs, alights on the ground with them widely apart and then returns to his original position by a second springing movement.* This test should be repeated several times and wide separation of the legs insisted on.

This exercise is especially valuable for determining small degrees of inguinal hernia. In two cases, one of them hailing from a certain Mecca of recruiting establishments, a quite noticeable hernia was made apparent by this means.

Any stiffness or lack of the power of abduction at the hips should be noted and a careful examination (with the aid of X-rays if necessary) made for signs of old caries, etc.

(7) *The scrotum and inguinal canals are next palpated for any abnormalities.* Judging from the large number of cases (seven in the past twelve months) that have come up for re-examination with undescended testicles lying in the inguinal canal (a particularly undesirable disability in a cavalry recruit), the above examination must obviously often be omitted by the officer carrying out the primary examination.

(8) *The stethoscope is now brought into use and the heart and lungs auscultated.* It is only very rarely that any defect necessitating discharge is found either in the cardio-vascular or respiratory systems, so presumedly an adequate primary examination is made.

Here let me add just one word of caution in dealing with supposed cases of D.A.H. and tachycardia. The heart, especially in the case of young recruits who may have been "down and out" for some little time prior to enlistment, is an extremely nervous organ and highly susceptible to external and temporary influences. In many instances on the morning of examination it has been impossible to bring the pulse-rate of an otherwise desirable recruit down to anywhere near the "hundred mark," but a few days' good feeding, prefaced by some words of advice concerning cigarette smoking, has produced a very marked change of affairs.

The following may serve as an example and as a warning:—

A recruit, a somewhat volatile Irishman, presented himself for examination one morning. He was well-grown but somewhat pigeon-chested, well above the usual average of intelligence of recruits and gave a history of previous commissioned service in the Irish Free State Army. He was keen to serve and we were keen to have him. His only real disability was a marked and persistent tachycardia combined with a soft apical systolic murmur, his pulse-rate remaining at 110-120 in spite of all steadying influences we could devise. He was detained. The following morning the tachycardia and murmur persisted and he was sent to the A.D.M.S. for his decision. He was examined both by the A.D.M.S. and by the officer in charge of medical wards. There was a slight difference of opinion as to the nature and causation of the murmur but none as to the tachycardia; tolerance tests were unsatisfactory and he was discharged. Within a few days he was returned to the recruiting centre where he was originally enlisted. There, presumedly after certain restful influences, he was examined by a board of (I believe) nine medical officers, who agreed that there was neither tachycardia nor murmur and tolerance tests were well performed. He was returned to us in due course for disposal with a

few appropriate and pertinent remarks on his dossier! His pulse on arrival was 84 and in due course he passed out a first-class soldier. Our mistake had of course been in not recognizing the potent effect of temperament on the heart of a somewhat "excitable Irishman."

I am now satisfied that a recruit if of good general physique should not be discharged for simple tachycardia unless he has a pulse-rate persistently over a hundred for a week. In doubtful cases additional tolerance tests to determine the effect on his cardiac efficiency of regulated exercises should also be carried out.

A recent amendment to Regs. A.M.S., para. xi, B (Army Order, No. 282, of 1925), recognizes the temporary "lapse from grace" that may occur in a healthy heart.

(9) *The tests for the upper extremities as laid down in the Regulations for the Medical Services of the Army* (Appendix 11B, para. 12) *are now carried out.* It saves much time if one stands in front of the recruit and oneself performs the test one desires him to carry out.

(10) *The mouth, teeth and tonsils are then inspected.* It is only rarely that a recruit has to be rejected for any intrabuccal condition, but only a few weeks ago slight hoarseness and scarring of the palate, in an otherwise eligible recruit, aroused my suspicions. Subsequent interrogation elicited the fact, borne out by letter, that the man was still under treatment at a venereal clinic for secondary syphilis.

(11) *The usual eye tests are now carried out.* Great care should be taken to ensure that each eye is properly covered (*not by the recruit*) during the testing of the other. It is better to pick out individual letters from each row of the test types than to ask the recruit to read a row straight off which he may have learned by heart. He should be made to face the test types squarely without "slewing" his head round in his efforts to pick out the letters, a manœuvre he obviously will be unable to perform when it comes to rifle practice later on.

On only a few occasions has it been found necessary to discharge a recruit for defective vision, and in at least two instances there was more than a suspicion (confirmed later, the recruits after discharge with vision $\frac{6}{60}$ E.E. having subsequently enlisted in other units with normal sight) that the men were malingering.

(12) *The usual questions regarding fits, wound or injury to the head discharge from the ears, etc., are now put.*

(13) *The examination finishes with a scrutiny of the ears of every recruit with Brunton's auroscope.* Very much our greatest percentage of discharges (see Table I) has been for otitis media, in many cases only too obvious (always confirmed by an ear specialist).

There is no doubt whatever that this examination of the ears is of all the tests the one most often omitted or "scamped" at the primary examination of recruits. Not infrequently one sees the note "drums not examined, wax in ears," in Table I of the M.H. sheet. This wax should

be and invariably is removed at this station, and many a case of latent otitis media or aural polypi has been revealed as a result. It is by no means safe to assert, as is so often done, that because an ear has cerumen in it that ear must be free from disease. One word of caution, however; frequently the removal by forcible syringing of old standing plugs of wax causes marked injection of the drum and along the external meatus, and one is often led to believe that disease exists when the condition may be due to the syringing and quietens down without treatment in a couple of days. It is a wise precaution to keep such a case for a few days under observation before sending him to the ear specialist for his expert opinion. The regulations regarding examination of the ears in intending recruits have recently been considerably tightened up, and if conscientiously carried out should greatly diminish the incidence of ear defects.

I have outlined in brief our method of examination, stressing those defects which are most frequently found to have escaped the eye, ear or hand of the officer carrying out the primary examination. A brief account of the relative importance from the military point of view of certain of these disabilities is now given.

Of the two defects pes cavus and flat feet, one should I think look with more suspicion on the former than on the latter. The individual with pes cavus often exhibits many of the stigmata of degeneration. In the first place he is usually weedy to a degree and not infrequently pigeon-chested with poorly developed thigh and calf muscles. He is apt to be under weight, the possessor of a high arched palate, and his mental condition may not be above suspicion. Much as one would like to discharge such defectives, it is often impossible to do so as many of them are so to speak "just within the legal limit" all round. Luckily they are not infrequently subsequently boarded regimentally as "unlikely to make efficient soldiers." The flat-footed individual, on the other hand, is usually, apart from his flat feet, of a good physical standard, deep-chested, muscular and intelligent. Many of them are of course Jews. Unless the condition be severe, the arch does not as a rule further break down during training.

Knock-knee of even moderately severe degree (up to three inches' separation of the feet) does not apparently handicap the recruit to any marked extent during his training, but it is often associated with other defects such as weediness, malformed chest, pes cavus, etc., and may just be sufficient in conjunction with one or other of the above-named to tip the scale against the recruit.

As far as my experience here goes, I cordially agree with the very trenchant remarks concerning bed-wetting made by Lieutenant-Colonels R. V. Cowey and C. R. Sylvester-Bradley, in their recent article on recruiting. Nowadays I never ask a recruit for any history of enuresis and am entirely unsympathetic if he subsequently volunteers one, nor is my attitude towards this pseudo-disability at the morning sick parade any less compromising. At the best enuresis is simply the expression of a neurosis

largely brought on by unfamiliar surroundings and work in a nervous recruit, a condition which usually subsides as he rises superior to his environment; at the worst it is sheer malingering. The possibility of organic disease must, of course, always be excluded.

Unfortunately we have no means of testing the disability incurred by lack of weight (many recruits are enlisted under 112 pounds), as although the training is strenuous recruits carry little beyond their own weight during their fourteen to twenty weeks at the depot. These light-weights do quite well during their preliminary training, many of them becoming good athletes and gymnasts, but there is often a tendency for their weight to "hang" little above what it was on enlisting, unlike that of the average recruit who gains steadily from month to month. I have at present under observation eight infantry recruits whose initial weights on enlistment were under 112 pounds (the lightest weighed only 107 pounds); the average gain of these bantams during some ten months' observation has only been one pound although they appear physically fit. Although most of them are able to complete their training without apparent harm, it may be a very different matter when they are required to carry the heavy war equipment worn by the modern soldier (loads up to eighty pounds were carried in the winter by many of our soldiers in France during the recent war), and it is difficult to see how a soldier of some 108 pounds can carry for any distance without undue strain a load amounting to two-thirds of his own weight.

For the above reasons I consider that 112 pounds should be considered the irreducible minimum below which weight no recruit should be accepted. It is to be noted that considerable latitude was until recently allowed by the A.M.S. Regulations in this matter of minimum weight.

(N.B.—A recent A.O. lays it down that no recruit will in future be enlisted under 112 pounds in weight.)

Concerning the much debated point whether recruits with signs of old ear disease and perforated drums should be rejected, I am entirely in agreement with the official ruling. If such cases were accepted, in all probability only a small number would fall out during their period of training or subsequent service in this country, but few with experience as regimental M.O.'s in a tropical country such as India could wish to see many such cases under their care, when the most innocent and quiescent of ears has a habit of flaring up into an acute suppurative otitis media in a very few days. These cases are the despair both of the regimental M.O. and of the ear specialist; rarely is anything like a cure of the condition produced and invaliding, that bugbear of army medical finance, is only too often necessary.

An unusually pale individual should be viewed with suspicion and closely interrogated as to his former work (miners and indoor workers are of necessity pale); in all doubtful cases it is probably safer to test the urine of such recruits. During the past few months two recruits, each with well-marked albuminuria and history of kidney trouble, have presented them-

selves for re-examination and have had to be discharged. The first of these was a very pronounced case. He was extremely pallid, possessing the typical, large white face which is traditionally supposed to accompany the large white kidney; in performing his tests he puffed and panted like an elderly dowager, and his vision was 6/nil E.E. His urine set almost solid on boiling. It is only charitable to assume that these acute symptoms had supervened subsequent to his primary examination, although he had all the aspects of a chronic case. A pallid individual such as this who is apparently out of condition, panting on slight exertion, should invariably have his urine examined.

If due care be taken to exclude at the outset of their military career all real defectives it is remarkable how few fall out by the wayside during their period of training, strenuous though it be.

Our discharge rate on re-examination, which has been fairly uniform during the whole period under review, has averaged 40·5 per thousand. The most frequent causes of discharge on re-examination at this station are shown in Table I. The last column of this table (abstracted from the Report on the Health of the Army for the year 1922) gives by way of comparison the ratio of rejections on initial examinations per thousand for the same diseases :—

TABLE I.

Most common causes of discharge on re-examination. (Canterbury)	(1) Actual numbers discharged	(2) Percentage of total discharged	(3) Discharges per 1,000 examined	(4) Rejections per 1,000 examined at initial examination, 1921-22
Diseases of middle ear	31	49·2	19·93	15·53
Other diseases of generative organs	6[1]	9·5	3·86	1·49
Varicocele	4	6·35	2·57	10·47
Other diseases of heart	4	6·35	2·57	19·88

[1] All cases of undescended testicle felt in inguinal canal.

It will be noted that the ratio per thousand of discharges from the depots for middle-ear diseases (col. 3, Table 1) is considerably above that of rejections on initial examinations for the same cause.

Table II gives the most frequent causes of rejections for medical reasons on initial examination for the years 1921-1922, abstracted from the Report on the Health of the Army, 1922. The last column of this table gives the ratio of discharges per thousand on re-examination for the same diseases during the period under review :—

TABLE II.

	Rejections on primary examination (1921-22). Ratio per 1,000	Discharges on re-examination (1924-25). Ratio per 1,000 (Canterbury)
Defective vision	52·50	0·64
Loss and decay of many teeth	49·98	—
Under chest measurement	47·49	—
Flat feet	26·99	1·29
Other diseases of heart	19·88	2·57
Diseases of middle ear	15·53	19·93

In writing this paper I trust it will not be assumed that I am attempting "to blow my own trumpet" at the expense of the officer who carries out the primary examination. However careful one may be, a certain small proportion of defects must necessarily be missed by each examining officer. I am perfectly willing to admit that yet another combing out would reveal similar "chinks in the armour" of those who re-examine the recruits at the depots.

It is also more than possible that many of the apparently most glaring mistakes made by those who examine recruits on primary enlistment are examples of "substitution," a form of deception difficult to trace unless full and accurate details of individual peculiarities are made in the "remarks" column of the M.H. sheet.

In conclusion, it remains only to be said that much of the "wind has been taken out of my sails" by the recent amendments to Regs. A.M.S., para. 11B., contained in A.O. 282, of July, 1925. These amendments are most comprehensive, rest on a sound medical basis, and should tend greatly to lighten the task of those whose duty it is to re-examine the recruits at the depots.

My thanks are due to Major F. C. Sampson, D.S.O., R.A.M.C., Officer Commanding Military Hospital, Canterbury, for much valuable help and advice in the examination of recruits and for permission to publish this paper. My thanks are also due to Colonel P. H. Henderson, D.S.O., R.A.M.C., for many valuable suggestions.

MOBILE DISINFECTION IN THE TROPICS AT NEGLIGIBLE COST.

By Major A. L. OTWAY,
Royal Army Medical Corps.
Late Medical Officer of Health, Sekondi, Gold Coast.

While holding the appointment of Medical Officer of Health, Sekondi, I thought it advisable to add to our powers of disinfection of clothing, etc.

I wished to increase not only our capacity for disinfection, but also to provide a means which should be :—

(1) Efficient.
(2) Cheap.
(3) Robust.
(4) Mobile.
(5) Simple to use.
(6) Would not deteriorate in use or in reasonable time.

If a disinfector can be produced which costs practically nothing, which any African can be taught to use in a few minutes, and which he cannot harm by ill-treatment, it is evident that a great need will be met.

Freedom from deterioration through rust or corosion of metal, or of leather or cloth bags from dampness, is a very important point on the West Coast, and one to which serious consideration has to be given.

A "sack disinfector" costs some £75, but will deteriorate when not in use, however carefully looked after.

The "sack" will perish with dampness and age, while the burner and other parts are injured by corrosion. It is evident that to increase the number of disinfecting units at £50 to £75 per unit is a costly and might even be a wasteful business. Many might never be in action, or, owing to deterioration through the climate, they might be useless when called upon.

I saw lying about here the familiar two-ribbed forty-gallon oil drums, and it struck me that I might use them in the same way as I had done while Commanding No. 145 Field Ambulance in Palestine. I used the method then with success for disinfestation, and the drums can be procured here for practically nothing.

By the method which I am about to describe we have :—

(*a*) A permanent increase in our disinfecting powers.

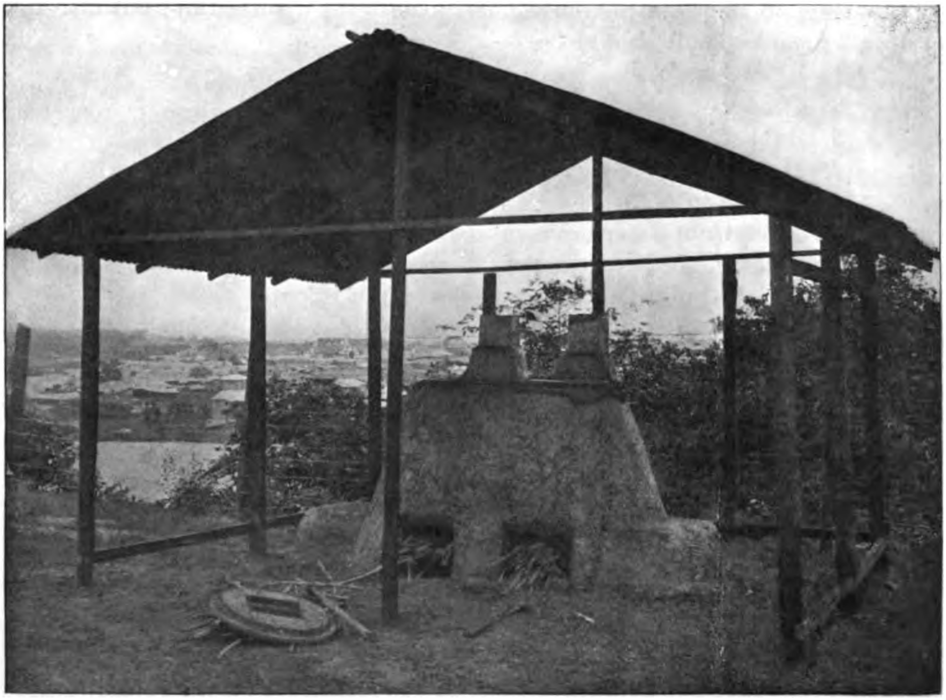
(*b*) A number of *mobile* disinfecting units which can be transferred at a moment's notice by one-ton Ford lorries to any place that is threatened with infectious disease. To obtain the same "striking power" of disinfection by "commercial" forms of disinfectors would cost a large sum of money and they would be no more efficient.

There is now a permanent disinfecting station made out of two forty-

gallon drums at the Contagious Diseases Hospital here, and there are a further six drums ready fitted with lids and grids for use as a mobile unit. Should any outbreak of plague, etc., occur in Sekondi or district, the intention is to place them in charge of inspectors in suitable places, so that clothing, personal effects, etc., of the populace could be rapidly, efficiently, and without damage disinfected by steam.

Each disinfector consists of a forty-gallon drum and

(*a*) Holds rather more than $1\frac{1}{4}$ times the amount of the "sack" disinfector.



SECCONDEE DISINFECTING STATION.

(*b*) Costs nothing to run except a little bush timber.

(*c*) Is thoroughly efficient, as is evidenced by the fact that it will boil an egg hard in fifteen minutes inside a bundle of blankets, thereby proving that the current of steam penetrates to every part. The "Test Egg" is placed under the topmost two layers of blankets—i.e., the part that remains cold longest.

(*d*) It can be run by any inspector after five minutes' instruction.

It is a type of disinfector that I can confidently recommend, being my own adaptation of the "Serbian barrel," as:—

(*a*) Being robust, it can be rolled down a hill, thrown out of a lorry—in

fact, dumped anyhow and anywhere without damage, for all practical purposes.

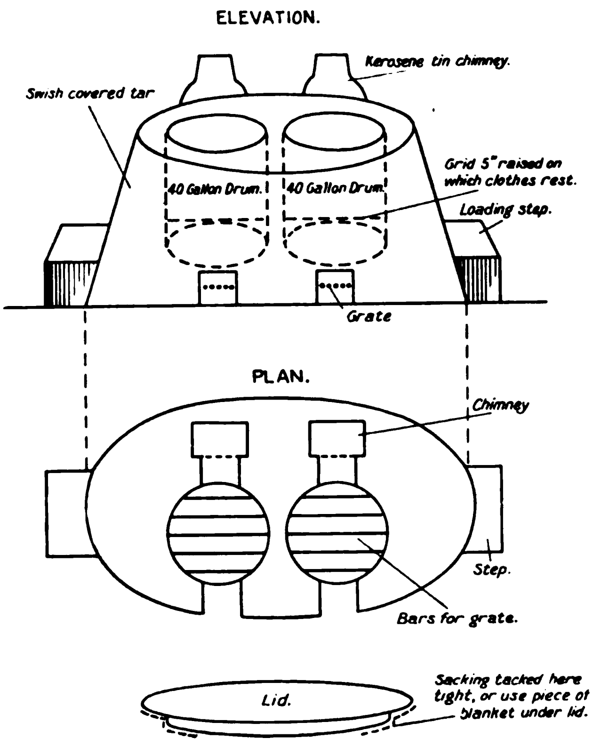
(*b*) It is economical to work.

(*c*) It is efficient.

(*d*) It *cannot* get out of order.

(*e*) A battery of them can be concentrated at any spot by rail or road, and can be working within half an hour of the time of arrival.

SKETCH OF DISINFECTOR MADE WITH 40-GALLON IRON DRUMS.



Two 40-gallon drums surrounded by dried tarred swish.
Separate chimney for each fire, made of kerosene tins, and separate fire for each drum.
Grate of iron bars.
Water in drums to be not more than 2½ inches or less than 1½ inches in depth.
Boil for fifteen minutes first, when starting from cold, before placing articles for disinfection.
Time of disinfection—twenty-five minutes.

(*f*) Any reasonable number can be obtained in Sekondi, and doubtless in other parts of the tropical world, as these drums are used for carrying oil, tar, etc.

The approximate cost per disinfector is about two shillings.

It will thus be seen that two of these, at the cost of a few shillings and a little unskilled labour (say four days' work for six men), will nearly do the work of three "sack disinfectors" costing over a £100.

The rapid concentration of means of disinfection at a threatened area in the town might well be a critical feature in preventing an outbreak on a large scale.

The public confidence and *morale* would be raised by seeing something active being done in this direction.

There is no doubt that "the public" *like to see* disinfection carried out immediately.

If an outlying town or village be attacked, the ability to concentrate disinfectors there would very likely be decisive as regards the ultimate result.

The photograph and drawing explains the construction of the *permanent* disinfecting station I have made at our contagious diseases hospital.

The two drums are shown raised and jacketed with "swish," covered with tar and have permanent grates and chimneys, also a roof.

"Swish" is the mixed red clay and gravel peculiar to this place, which when damped and kneaded well, dries hard like a terra-cotta brick. Any other clay or earth would do as well.

The fires burn furiously and steam is rapidly raised. An ounce or so of izal is added to the water in each drum each time it is loaded. We thus get vapourized izal and steam penetrating the clothing, etc.

The notes on the sketch fully explain the construction.

It will be noted that the articles for disinfection are raised on a light wood grid on four legs, five inches above the bottom of the drum.

The photo illustrates the whole construction of a permanent station which was erected for me by No. 7248841 Cpl. J. Harper, R.A.M.C. (seconded), one of my Superintending Sanitary Inspectors, with African labour. He has carried out my ideas perfectly in every way, and produced a disinfector which is not only efficient, but is symmetrical and pleasing to look at.

It will be borne in mind that these, as the photo shows, are erected as a permanent structure, jacketed with "swish," roofed over, and tarred.

In case of emergency the "barrels" complete with grids, lids, etc., would be simply transported to the required spot, raised on stones and put into immediate action. More fuel would be required, but this is of no practical importance.

By the use of these drums, as I describe them, we have a great power of disinfection placed in the hands of any M.O.H. in such a country as this, and at a cost of practically nothing.

I have to thank Dr. G. Hungerford, the Honourable the Director of Medical and Sanitary Services, Gold Coast, Accra, for permission to publish this account, and also to thank him, together with Dr. G. J. Pirie, Deputy Director of Sanitary Services, Gold Coast, Accra, for the kindly interest they showed while I was making my disinfector here.

NOTES ON REGIMENTAL MESSING ARRANGEMENTS.

By Captain and Quartermaster G. A. COLLIER.
Royal Army Medical Corps.

Before the Great War a messing officer was appointed to supervise the messing arrangements of an area.

The company commander saw and signed the company messing book each day. This book (A.B. 48) has now become a regimental account.

The ration consisted of one pound of bread and three-quarters of a pound of meat; 3d. cash allowance was made to supplement the ration and was called a messing allowance.

A cash allowance of 6d. in lieu of the bread and meat rations was granted to men when on leave or furlough.

The groceries were augmented by an additional cash payment made by the soldier, usually 1d. or ½d. per diem, and the amount subscribed was further supplemented by a grant from the regimental funds when necessary.

The food was served and eaten in the men's barrack-room, until eventually a barrack-room was allocated as a temporary dining-room.

The provision of dining-rooms was not generally made until the Great War.

Since the commencement of the Great War the system has changed and the soldier is fed wholly at the public expense.

This method has caused a new system of accounts with a monthly audit for safeguarding the expenditure of public money.

The ration now includes groceries and a cash allowance.

The food supplied is calculated to provide a daily ration of fuel value sufficient to make good the average man's daily output of energy.

The basis of messing is a cash transaction; the system permits a careful check on expenditure and should eliminate the possibility of loss by waste or careless requisitioning.

A banking account opened by an officer i/c messing is subject to the conditions stated in paras. 372 and 373 Financial Instructions, 1924. A.C.I. 145 of 1924.

In future the C.O. (or second in command on his behalf) will countersign A.F. F716 as evidence that he has checked the cash and bank balances.

The cash is a running account and the money should be so expended that there is not an undue accumulation of funds at the end of the month.

A unit or formation will be allowed to carry forward to the next monthly account any cash credit (including the value of foodstuffs purchased from the N.A.A.F.I., or drawn from the R.A.S.C. in kind) except

at September 30, when the credit to be carried forward will not exceed four days' cash and commuted cash allowances (including the value of foodstuffs if held in stock). Any further credit at September 30 will be surrendered to the public.

Local auditors (or command paymasters in commands where there is no local auditor) will bring to the notice of command headquarters any excessive credits observed in the monthly inspection of accounts.

The local auditor has the authority to order the return of the unexpended cash credit which has accumulated during each year, ending September 30, to the paymaster (see Allowance Regs. para. 50 and para. (2) of A.C.I. 234 of 1925).

Amendment to Para. 50 *Allowance Regulations.*—While expenditure on messing resulting in a debtor balance on the messing account should not normally occur, units may, in the event of a debtor balance arising, be allowed to carry forward at the end of a month (excepting September 30) a balance debtor not exceeding the value of two days' cash and commuted allowances. No debt at all will be allowed at September 30 or on closing the account. A.O. 152/1925.

Debtor balances will be restricted to two days' cash and commuted cash allowances at the end of each month (except September) and any excess will be paid for. A.C.I. 234/1925.

The cash allowance instead of the whole ration, at present, is between 1s. 1d. and 1s. 2d. per diem; the exact rate is published periodically; and this is termed the "lower rate."

The "higher rate" (at present 1s. 7d. per diem) is issued to an officer or soldier on leave, or when it is not possible to issue rations in kind.

Reference para. 1 of A.C.I. 469 of 1921, the cash value of the commuted articles of the fixed ration is about 3·6720 pence per man per day.

The latest commutation is made up as follows and varies monthly:—

Bacon	2 oz. ..	1·9107 pence
Cheese ..	1 ,, ..	0·8105 ,,
Jam	1½ ,, ..	0·5625 ,,
Margarine ..	1 ,, ..	0·3883 ,,

As the N.A.A.F.I. supply these articles at contract rates, there is not any rebate given on this expenditure.

The rations supplied by the R.A.S.C. are priced on the A.F. F3179 and the remaining balance of the value of the ration is expended on foodstuffs supplied by the N.A.A.F.I.

The purchase of luxuries (e.g., tinned pears, pineapple, apricots, etc.), is forbidden and cannot be admitted as a charge against messing accounts. A.C.I. 234/25 and A.C.I. 469/1921.

An exception may, however, be made in the case of Christmas and New Year fare, for the provision of which O's.C. units may authorize the expenditure of any additional saving which may be effected on the cash portion of the ration during the *December quarter* up to a maximum of

2s. 6d. a man in mess (based on the average number of men in mess during the quarter).

The expenditure of savings from the messing funds in aid of Christmas or New Year fare must be restricted to the purchase of articles of food and drink and not extended to the provision of such articles as pipes, tobacco or cigarettes.

The scale of rations at home stations is as follows :—

(*Allowance Regulations*, 1924, *para* 28.)

		Approximate cash value
Meat, frozen or fresh	12 oz.	6·53 pence
or		
Meat, preserved	9 ,,	
Bread	16 ,,	
or		
Biscuits	12 ,,	
or		
Flour	12 ,,	
Sugar	$1\frac{1}{2}$,,	
Tea	$\frac{3}{8}$,,	
Salt	$\frac{1}{4}$,,	
Bacon	2 ,,	3·67 pence
Cheese	1 ,,	
Jam or syrup	$1\frac{1}{2}$,,	
Margarine	1 ,,	

Plus a daily cash allowance of 3½d., subject to periodical review by the Army Council. For accounting the total cost is : 13·70 pence.

The scale of rations for active service is as follows :—

Meat, fresh or frozen	1	lb.
or		
Meat, preserved (1 lb. nominal)	12	oz.
Bread	1	lb.
or		
Biscuits	12	oz.
or		
Flour	12	,,
Bacon	3	,,
Cheese	2	,,
Vegetables, fresh (when obtainable)	12	,,
Jam	2	,,
Butter or margarine	1	,,
Condensed milk	$1\frac{1}{2}$	,,
Tea	$\frac{5}{8}$	,,
Sugar	3	,,
Salt	$\frac{1}{4}$	,,
Mustard	$\frac{1}{100}$	,,
Pepper	$\frac{1}{100}$	,,
Lemon juice[1] (at the discretion of G.O.C. on the recommendation of medical officer)	$\frac{1}{10}$	gill
Rum, ditto ditto	$\frac{1}{2}$	,,
Tobacco (for those who smoke) per week	2	oz.
Matches ,,	2	boxes

[1] As the value of bottled lemon juice is very small as an antiscorbutic, germinated pulse is recommended when fresh vegetables are not available. The process is described in Appendix 3.

In case of active operations in the field, a special scale of rations dependent on the climate and the circumstances of the expedition, will be fixed by the G.O.C. and reported to the War Office, but the scale will as far as possible be adopted as a guide. Para. 33, Allowance Regulations 1924.

An iron ration is issued to every man in a field unit and is carried on his person. It is intended to provide subsistence for thirty-six hours in an emergency. An officer is responsible and gives orders when consumption of the ration is necessary. Field Service Regs., Vol. I of 1923, Section 152, para. 3.

The *iron ration* consists of :—

Meat, preserved	1 lb. (nominal)
Biscuits	1 ,,
Tea (in tin)	$\frac{5}{8}$ oz.
Sugar ,, ...	2 ,,

R.A.F. EMERGENCY RATION.

Emergency chocolate	$6\frac{1}{2}$ oz. in tin
Chewing gum	$\frac{1}{2}$,, (1 pkt. of 5 sticks)
Biscuits	1 lb. (4 packets)
Tea	$\frac{1}{2}$ oz. (in a tin)
Sugar	2 ,, ,,
Preserved meat..	12 ,, (1 lb. normal)

The whole packed in a calico bag. The above iron and emergency rations will probably be revised.

At stations abroad, on very exceptional occasions a free ration of $\frac{1}{2}$ gill of rum may if available be issued under authority of the G.O.C. when certified by the senior medical officer to be absolutely necessary for safe-guarding the health of the troops. Allowance Regs., para. 32.

A free issue of $\frac{1}{64}$ gallon of rum to be made to airmen on the authority of the A.O. C. supported by a certificate by the P.M.O. stating the issue is absolutely necessary for the safeguarding the health of the men who have become drenched or chilled through exposure on manœuvres or at special training.

The special scale for patients in hospital is given in Allowance Regulations 1924, Section VII.

The scale for men in detention is given in Allowance Regulations 1924, Section VIII.

ACCOUNTS AND REQUISITIONS.

The daily ration of bread and meat is demanded from the R.A.S.C. Supply Department on A.B. 55 (two days in advance). The indent is prepared by the quartermaster on the strength return supplied to him from the battery or company office. Supplementary indents are permissible to provide for unexpected arrivals.

The demand for groceries, supplied from R.A.S.C. depots, is submitted once a week and the groceries are delivered in bulk and accounted for as directed in Aldershot Command Order, No. 1286 of October 27, 1923.

A unit, by arrangement with the Officer in Charge of Supplies, may provide suitable boxes with locks and keys in which the grocery rations are placed. The idea is to prevent the foodstuffs from becoming mixed with particles left in sacks and eliminate the possibility of loss or waste during delivery.

The number of rations drawn is accounted for in the abstract of rations of the Pay List, Army Form N. 1504 A.

The quantities of rations received either by the R.A.F. or the Army are recorded in A.B. 109, and at the end of each period the supply department prepares A.F. F. 3179, showing the cost of the quantities of rations issued to the unit; this is the means whereby the cash expenditure is checked and safeguarded.

Deliberate underdrawals of the R.A.S.C. rations in kind, in order to convert items into cash for additional mess expenditure, will not be permitted. A.O. 152/1925.

It is important that the R.A.S.C. portion of the ration should be drawn up to the authorized scale. A.C.I. 234/25.

The quantities of rations received are also recorded in the messing book A.B. 48, and the groceries purchased from the N.A.A.F.I. are also recorded in this book.

The messing accounts are to be compiled daily, completed at the end of each month and forwarded to local auditors for examination. A.C.I. 234/25.

The airmen's messing account is Form 848, signed daily by the adjutant and examined by the Accountant Officer, R.A.F., K.R. 1721 (1).

The orderly officer in the R.A.F. is held responsible for the duty of examining all foodstuff on receipt at the unit.

A daily store account has been instituted in accordance with A.C.I. 58 of 1922, and is described in the Management of Soldiers' Messing, 1924 edition, Schedule "A."

This is a simple method of book-keeping which enables an inspecting officer to check the quantities of supplies which have been received, issued and the amount remaining.

A separate book has been recommended for use when bread, meat and groceries are received in separate store-rooms.

This system is complementary to the Army Book 48 and greatly assists an auditor.

The entries in the store account are made daily by an N.C.O. and show receipts, issues and any balance of foodstuff which has accumulated, possibly by over demands of supplies due to unforeseen fluctuations in the daily ration strength.

The officer responsible for the messing of the men will see, day by day, that the articles of diet provided accord with the requirements of the day's dietary, so as to obviate the provision of foodstuffs not required or the issue of excessive quantities. A.C.I. 234/25.

The sacks or containers are returnable and if not returned to the supply department a debit voucher will be sent charging the unit with the cost.

Disposal of By-Products.

The disposal of by-products is dealt with in (1) Kings Regulations, para. 1485; (2) A.C.I. 234 of 1925; (3) Manual of Military Cooking, pages 118 and 121; (4) K.R., R.A.F., para. 1721; 1730.

Sale of By-Products.

The prices agreed between the War Office and the approved buyers for bones, dripping, fats, etc., collected from units in the Aldershot Command during the month of December, 1925, are as follows:—

Collected by National By-Products, Ltd.

	£	s.	d.	
Fats.				
Dripping, free from moisture and/or dregs	0	17	0	per cwt.
Butchers' fat	0	3	0	,,
Cracklings	0	2	6	,,
Meat scraps	0	2	6	,,
Grease trap fat	0	6	0	,,
Bones.				
Marrow-bones—clean, uncut and unboiled	0	5	6	,,
Other bones	0	1	6	,,
Horse bones	0	1	6	,,
,, hoofs	0	1	0	,,
,, flesh	0	2	6	,,
Scrap bread	0	4	0	,,
Swill—per 100 men	1	0	0	,,

As each class of these by-products has a marketable value separate receptacles should be provided.

The refuse tubs should be examined daily.

Swill is of the least value.

Large quantities of waste food denotes either bad cooking, bad management in the serving out, or over issues of the material.

The first-class white dripping is used as a substitute for butter or margarine. A minimum of fifty per cent should be used in the provision of the men's dietary, and the remainder may be disposed of to married families and to the men's mess for consumption.

An account of the dripping saved is included in the recapitulation table of A.B. 48, and charged at the rate of the current commuted price of margarine sold by the N.A.A.F.I. The amount is credited to the By-Product and Swill Fund.

By-Products and Swill Account.

The proceeds of the sale of by-products of the soldiers' ration and swill will not be brought to account in the soldiers' messing account (A.B. 48), but will be credited in a separate account. A.C.I. 234/25.

This account will be audited in the same way as other regimental accounts.

Expenditure of proceeds of by-products and swill will be confined to:—

The cook's extra pay (see A.C.I. 340 of 1921).	Rate 1 = 6d. per diem when the sales of by-products = 7s. per 100. Rate 2 = 3d. per diem when the sales of by-products = 5s. per 100.

The provision of cook's clothing—see also para. 1732 (2) RA.F., K.R.

The purchase of messing utensils and necessaries.

The provision of additional messing. A.C.I. 234 of 1925 and Air Publication 112, para. 130.

Note.—Any voluntary contributions by troops for the purpose of extra messing should be accounted for in A.B. 48.

Messing Committee.

A messing committee, usually consisting of an officer, and N.C.O. and four men, meet once a week to draw up a weekly menu and submit recommendations to the commanding officer.

The Manual of Military Cooking and Dietary, Management of Soldiers' Messing, and the Universal Diet Sheets, issued from time to time, will be taken as a guide in determining the quantities of foodstuffs required. A.C.I. 234/25.

Irregularities in over-issuing or apparent waste, discovered in audit, will be reported to command headquarters for necessary action.

The menu, or diet sheet, should be closely followed when issuing the cooked food; any alteration, due to unforeseen circumstances, should be made by the messing officer.

For suppers, see para. 10 of War Office specimen diet sheet. In the R.A.F. suppers are always provided (King's Regulations, R.A.F., para. 1722).

A knowledge of food and food values is essential; the purpose of food being to supply energy.

The N.C.O. or men of the committee should be in a position to bring to notice the requirements of the men, and as usually one or more members of the unit criticize the messing arrangements constantly and adversely, it is considered quite a good plan to have these men on the committee.

Troops should always receive a meal before an early morning start, or before commencing a night move. Field Service Regulations, vol. ii of 1924, Section 173, para 2.

Examination of Foodstuffs.

Meat.—Instructions for R.A.F. officers regarding the inspection of bread and meat are given in App. "A" Air Publication, para. 112.

The meat ration is usually frozen beef obtained chiefly from the Colonies; it is examined and passed by Government inspectors.

As frozen meat cannot be properly cooked until thawed, arrangements must be made for thawing. During very cold weather, it will be found a great help to have one day's ration of meat hanging in the meat store in anticipation of the receipt of the next day's supply from the R.A.S.C. To assist the thawing process the carcase may be sponged down with a cloth wrung out in very hot water. It is not to be washed in hot water, but merely wiped over with the hot cloth.

A diagram showing the method of dividing a beast into joints is given on pp. 67 and 69 of the Manual of Military Cooking.

The cooks should know how to cut meat into suitable joints, for roasting, boiling or salting, and know the names of the various parts of the beast, and how each part is cooked, otherwise the meat is mutilated in the cutting up and not cooked in the most suitable form.

The meat should be boned before being cooked, which permits of rapid and good carving.

The bones are to be used as stock.

Prime joints are: Chuck rib, middle rib, fore rib, sirloin, aitch bone.

For salting use: Thin flank, brisket, silverside.

In the case of home-killed beef. Animals are landed alive at Liverpool from the Argentine, brought to the requisite condition and are killed in the Liverpool abattoirs.

A beast is killed for the instruction of the R.A.S.C. butchers once weekly. The meat is issued to the various hospitals in the Command.

Preserved meat and biscuits in lieu of bread are issued periodically as directed by A.C.I. 844 of 1920, and 401 of 1924. Preserved meat is issued, half-ration on alternate Mondays.

Note. Ration Values.—The messing account is to be credited with 0·11 pence for every pound of preserved meat issued to the unit. War Office letter 53/Gen/2878d/31.1.1925.

Bread.—The ration of bread is issued daily and is a day old when issued. A bread-cutting machine with a hand guard should be in use in every dining-room. The bread is then economically distributed, waste is eliminated and the possibility of saving bread is ensured in order to obtain the equivalent quantity of flour.

Flour may be obtained in lieu of a portion of the bread ration; three-quarters of a pound of flour for one pound of bread.

Biscuits, three-quarters of a pound are issued periodically as directed by Army Council Instructions in lieu of the ration of one pound of bread. A half-ration of biscuit and half-ration of bread is to be issued for consumption on Friday of each week.

Note.—The messing account is credited with 2·18 pence for every pound of biscuit issued to the unit. War Office letter 53/Gen/2878d/31.1.1925.

THE N.A.A.F.I. GROCERIES, ETC.

Instructions regarding supervision; R.A.F., K.R. 1745 to 1778.

A price list of the foodstuffs supplied by the N.A.A.F.I. is issued periodically.

A discount of eight per cent is allowed on the articles purchased, excepting those which are supplied at Army contract rates.

A balance sheet is to be published in Regimental Orders after the quarterly audit of regimental institute accounts, showing amount of rebate received and method of disposal. King's Regs., para. 88a.

All goods received should be examined and weighed on receipt to guard against shortage and waste.

The weight of the sacks or other containers should be ascertained.

Potatoes are usually of a poor quality from the end of the year until the new potatoes are available.

They have been stored in pits, and through overheating become spongy, and when cooked are often discoloured.

When the potatoes are received from the contractor they should be emptied out of the sacks to allow a free access of air, which will prevent deterioration.

The damaged potatoes should be sorted out and the waste returned to the contractor for an exchange to be made or an allowance given.

Vegetables delivered in sacks should also be exposed to air and sorted. The vegetable store should be dry and well ventilated.

Cabbages should have firm good hearts; this can easily be ascertained by pressing the centre, and if found to be undeveloped leaves, should be returned to the purveyor.

Fresh cereals have a glossy or shining appearance; old cereals have a dull appearance and often contain weevils.

The cereals should be examined on receipt, and articles damaged by weevils should be rejected.

Providing that there is sufficient cash available, it is recommended that fish should be provided for the mid-day meal once a week instead of meat. As this forms a very light meal, a suet or bread pudding should follow.

The staff of the N.A.A.F.I. are useful and obliging, and the manager of the local institute is always prepared to rectify mistakes or complaints.

(*To be continued.*)

A CORRESPONDENCE CIRCLE.

XII.

Royal Army Medical Corps Funds.

By Colonel H. KNAGGS, C.B., C.M.G.

As there is a very considerable amount of misconception amongst officers as to the various funds associated with the Corps, the following notes are written with the view of explaining their origin and the functions they fulfil.

(1) R.A.M.C. FUND.

This Fund, which was instituted in 1902, was originally intended for the maintenance of the Corps' Band, to provide from time to time memorials to distinguished officers, and also to provide funds with the view of lessening the cost of the Annual Dinner to subscribers.

A charitable fund did not form part of its activities. There were, however, in existence charitable funds for cases of distress arising amongst N.C.O.'s and men and women and children of the Corps, and another fund for the benefit of widows and orphans of the Corps.

Later, what remained of these charitable funds was included in the R.A.M.C. Fund, under the heading General Relief Branch.

It would be seen, therefore, that the R.A.M.C. Fund consists of :—

(*a*) The Officers' Branch, which provides for maintenance of Corps' Band, Memorials to distinguished officers, and Annual Corps Dinner, enabling subscribing officers to dine at reduced rates.

The Committee is also empowered to make grants from this Branch in cases of special distress occurring amongst widows and dependants of officers, and pays the annual subscriptions to the Royal School for Officers' Daughters at Bath, which gives the Committee forty votes at each half-yearly election for competing candidates.

This Branch also subscribes to the General Relief Branch.

(*b*) The General Relief Branch is supported by grants from Regimental Institutes and donations from officers, with the object of relieving cases of distress which may arise amongst W.O's., N.C.O's. and men and their families.

The subscription to the R.A.M.C. Fund is £1 per annum.

The accounts of the two branches are kept entirely distinct in different ledgers, submitted annually to professional auditors, and published in the Corps News, where the proceedings of each quarterly meeting will also be found.

All capital invested in both branches is held in the name of the trustees, Messrs. Holt and Co.

(2) R.A.M.C. (ALDERSHOT) SCHOOL FUND.

This Fund was established in 1921 as a separate entity, and the Trust consisted of a capital sum of £9,000 in five per cent National War Bonds, the interest of which provides the income of the Fund. Half this income is payable to the Auxiliary R.A.M.C.

The income is utilized for the education of the children of W.O.s, N.C.O.s, and men of the Regular R.A.M.C., orphans having preference.

In the case of the Auxiliary R.A.M.C. the money is utilized for the benefit of children of men who enlisted for the duration of war.

In the event of the whole of the income not being expended in any one year the surplus may be used for assisting in educating the children of officers of the Corps whether they served only during the war or belonged to the Regular Army, orphans to have preference.

(3) R.A.M.C. OFFICERS' BENEVOLENT SOCIETY.

The Society was founded by Sir James McGrigor, Bt., in 1820, for the benefit of orphans of commissioned Medical Officers of the Army Medical Service.

Records are preserved of the earliest meetings of the Committee, and by the rules drawn up by the Founder and the original subscribers it was decided that all legacies should be invested and all surplus receipts at the end of each year should be added to the Funded Stock. Only the subscriptions and interest from investments are allowed to be utilized in donations.

Money accumulated gradually, but the greater part of the income is still derived from interest on investments.

At the Annual General Meeting held in 1912, it was decided to admit the orphans of Quartermasters of the R.A.M.C. to the same benefits as orphans of other officers, and this decision has been acted on ever since.

An increasing number of sad cases are being brought to notice arising from the Great War, and the Committee trust that it will never be necessary to refuse assistance to the orphans of any deceased officer through lack of funds. When dealing with applications preference is given to the orphans of officers who have been subscribers.

The number of subscribers this year is only 411 against 439 last year, and 469 in 1923. Annual Grants for the maintenance and education of orphans are made at the General Meeting in June of each year and have varied during the past three years between £760 and £1,422. The funds are sufficient to meet these grants each year, but owing to the falling off of subscribers it is urgently desirable that all officers on the Active List should subscribe.

The lowest annual subscription which entitles a subscriber to a vote is one guinea.

It should be noted that the R.A.M.C. Officers' Benevolent Society

has no connexion with the R.A.M.C. Fund, nor with the Army Medical Officers' Widows' and Orphans' Fund, which is purely an insurance fund with annual premiums.

(4). SPECIAL TRUST FUND.

The income of this Fund is derived from a sum of £500 invested in £800 3½ per cent Conversion Loan Stock, which amounts to £28 per annum. Under the terms of the Trust the income is to be utilized in assisting in the education of the sons of deceased officers of the Royal Army Medical Corps and Auxiliary Forces, including officers who held temporary commissions who were killed in action, or who died of wounds or disease resulting from active service during the Great War, preference being given to the sons of Roman Catholic officers.

This Fund is administered by a Sub-Committee appointed by the Committee of the Royal Army Medical Corps Officers' Benevolent Society.

It is hoped that this brief statement will make matters clear with regard to the various funds. The rules governing the funds are at present being amended and brought up to date, and when approved by the Annual General Meeting in June next, copies will be available for all officers on the Active List.

It is earnestly hoped that all non-subscribing officers will subscribe to both the Royal Army Medical Corps Fund and Royal Army Medical Corps Officers' Benevolent Society as the need in both instances is becoming more urgent.

Army Medical Officers' Widows' and Orphans' Fund.

By Captain J. T. CLAPHAM.
Royal Army Medical Corps (R.P.).

This Fund is a Life Assurance Society, and should not, as is often the case, be mistaken for a charitable fund, such as the Royal Army Medical Officers' Benevolent Society.

It was founded in the year after Waterloo by the efforts of the then Director-General, Sir James McGrigor, F.R.S. A detailed account of its formation will be found in Corps News of June, 1925, to which a few remarks may be added before dealing with its business side.

In those days life assurance was in its infancy and the attractive options now offered were unknown. No doubt this was one reason for the rapid growth of membership, which within a few years of its foundation reached 600. In 1838 it was registered as a Friendly Society. The object of this, then, was to enable its funds to be deposited with the Commissioners for the Redemption of the National Debt at 3⅘ per cent.

Registration implies restriction of benefits, £300 being the maximum capital sum which may be paid at the death of a member, and the maximum annuity is £52.

Its advantages are that members obtain the guarantee of official surveillance and, at existing rates, the very tangible benefit of freedom from income tax. After the fifties the membership rapidly declined, partly no doubt owing to the more varied attractions offered by the great life offices and partly to the reasons mentioned in the earlier article.

In the meantime, a large fund had been built up of which present members are reaping the benefit at the quinquennial valuations.

In 1894, it was found that the flat rate of subscriptions then in force of £10 per annum for married members who joined as such and £6 for those who had previously been on the unmarried list, together with various marriage fines, was inadequate to keep the Fund on a sound basis. The rate of subscription was then raised to £22 with the result that hardly any officers joined till 1906, when the Fund was thoroughly re-organized, on professional advice, and a scale of subscriptions graduated according to ages of husband and wife was introduced.

Since then the membership has nearly doubled and it is hoped will reach 200 before the close of the present year.

After the quinquennial valuation at the end of 1910, the first distribution of surplus took place in the form of secondary benefits detailed below, which it will be seen have been increased at each successive valuation.

For many years by far the greater part of the funds of the Society were on deposit with the Commissioners for the Redemption of the National Debt at a rate of 3⅛ per cent. When the five per cent War Loan was issued during the war this money was invested therein and the income of the Society proportionately increased. During the past year this has been re-invested in longer-dated securities and the Society now holds over £200,000 (nominal) in Trustee Securities, mostly British Government stocks.

The Rules have recently been completely revised and registered under the Friendly Societies Act. The benefits and rates of subscription are not affected thereby. The new Rules will be issued shortly.

The primary benefit provided by the Fund is an annuity of £50 during widowhood, to the widows of officers who have held permanent commissions in the Royal Army Medical Corps. In the event of the death of the widow this annuity is continued to the children of such marriage until the youngest attains the age of 21 years. It also continues for their benefit, up to the same age, if the widow remarries. Furthermore, should the wife of the subscriber predecease him, it will be optional for him to continue the subscription he had been paying as a married member, in order to provide an annuity similar to the above for the children of the marriage, until the youngest shall have attained the age of 21 years.

To the above primary benefit have been added, of recent years, others from distribution of surplus which increase substantially the value of the benefits covered. Thus, at the valuations at December 31, 1910, 1915, and

1920, provision was made for sums varying, according to length of membership, from £100 to £300 to be paid on the death of a member on the books at those dates to his widow or children. The annuity to such widow or children was increased to the statutory limit of £52. Furthermore, at the valuation of December 31, 1920, provision was made for an annuity of £13 to each child, not exceeding four, of a member on the books at that date, to commence on the death of the father and continue till aged 21. Also, reductions were made (after five years' membership) in the subscriptions of members varying from twenty to sixty per cent according to the length of membership.

The Actuary is of opinion that the provision of additional benefits on the above scale will be at least maintained at future valuations, members benefiting according to the duration of membership.

It must be understood, however, that the additional benefits to be granted in the future will depend on the surpluses disclosed by quinquennial valuations.

The subscription covers all war and climate risks, including service in West Africa. Any such due to a widow is paid immediately on the receipt of the necessary papers without the usual wait for probate to be granted.

Examples of the annual subscription for married members which may now be paid in equal half-yearly instalments are:—

Husband's age		Wife's age		Annual subscription
30	..	27	..	£14 6 1
36	..	33	..	£16 17 2

These subscriptions are subject to abatement out of quinquennial surpluses.

Unmarried members pay an annual subscription of £2, and on passing to the married class are allowed the equivalent of all past subscriptions in the unmarried class by way of reduction of their annual subscription in the married class. Should they pass to the married list in time of war, they are not liable for any extra charge which may then be in force for new members.

The Secretary will be glad to send the Actuary's valuation and other reports, and give further information as to details.

Origin of the Crest of the Royal Army Medical Corps.

By A Correspondent.

We are apt, many of us, to accept and wear official badges and buttons on our uniforms without thinking about them, but they have all been the subject of considerable thought by those who devised them, and all have a reason for their adoption.

The crest of the Royal Army Medical Corps has, as its central device, a serpent coiled round a staff. This and the motto "In Arduis Fidelis"

were conferred upon us when the Corps obtained its present status and designation in 1898.

This device, with variants, has been adopted by the army medical services of some other countries.

The serpent and staff were the distinctive emblems of the ancient Greek god Æsculapius, who was the god of healing, and have been handed down to the medical profession in direct line from him, and, indeed, we derive practically all our medical nomenclature from ancient Greece.

Æsculapius was the son of the god Apollo, and Hygeia was his sister. Apollo himself had healing attributes, and he too was connected with a serpent or dragon named Pytho, which he conquered and established the Pythian oracle at Delphi; but in this case healing was not specially concerned, and snakes in general were fancied to be spirits of the dead coming out of the earth.

The legend which accounts for the adoption of the snake by Æsculapius as his emblem is as follows:—

Æsculapius had a clinic in the Vale of Tempe, which is a gorge at the foot of Mount Olympus in Thessaly, on the summit of which the gods abode; and one day when he was sitting in his cavern or consulting room, he saw two snakes come in, one, evidently sick, being helped in by its companion; the other, after depositing the patient, went out and presently returned with a leaf in its mouth which it administered (how is not said) and quickly restored the sick snake to health.

Æsculapius took note of the leaf and collected a stock of the plant, and by its use effected many cures among human beings.

This gave him a great reputation and his cult spread all over Greece and further. Many temples were dedicated to him, the snake not being forgotten, and he was finally established in his specialism as the divine physician.

So we see that the art of healing was considered worthy of the gods.

The snake has, in many lands and many ages, been regarded with awe and veneration, whether in connexion with healing or otherwise. The brazen serpent lifted up by Moses in the wilderness for the cure of the Israelites bitten by the fiery serpents is a case in point. Mercury, the messenger of the gods, carried a caduceus which was a winged wand with two serpents coiled round it, which is to be seen in the crest of the Royal College of Surgeons.

The snake appears also in the temple sculptures of early inhabitants of South America—in what capacity is not known. Nor are the activities of the serpent in the Garden of Eden likely to be forgotten.

Its vogue is not altogether surprising—as the element of mystery, even now, in the shape of electric sparks or Abraham's box, is one which impresses the human mind; and the snake, in its appearance and movements and traditions, is a mysterious creature. We may therefore regard it as an historic and venerable symbol in our crest.

The staff, too, has some significance, and was an accessory emblem of Æsculapius. It constantly appears in his effigies, being often of the dimensions of a club. Remarkable properties were attributed to certain rods, such as Aaron's rod, which turned into a serpent, and the magic wands of magicians and fairies. A majestic-looking walking-stick was a part of the costume of many physicians in the Elizabethan and Stuart periods, though this had a special purpose, as it often had a vinaigrette in its head, which was charged with essences for the warding off of aerial infection.

The motto, "Faithful under Hardship," speaks for itself.

The laurel wreath and crown are insignia indicating State service and and are not peculiar to our Corps crest.

Editorial.

THE REPORT OF THE MEDICAL RESEARCH COUNCIL 1924-25.

THE eleventh annual report of the Medical Research Council gives a well-balanced account of the scientific work to which the Council has given aid from the £135,000 provided by Parliament.

The statements of the aims and successes of the research work are necessarily condensed; but a study of the report indicates the wide field covered by the various workers, and at the end of each section there is a list of the papers already published which can be consulted by those interested in any particular investigation.

In the introductory chapter the Council discusses the advances which have been made in the study of immunity and infectivity, in the investigation of filter-passing viruses and of cancer, and in the determination of biological standards.

The scientific analysis of immunity reactions is very difficult; some of the reactions belong to the leucocytes which have been studied by Sir Almroth Wright, but the Council state that it is uncertain how far the behaviour of the leucocytes under artificially-controlled conditions outside the body is truly representative of their behaviour within the body. Elaborate studies have been made of "aggressins," agglutinins and precipitins, but for a better understanding of the defensive chemical mechanisms we must look to the development of chemical and physical knowledge. Dr. Dudley and Dr. Laidlaw have been studying the chemical nature of a substance prepared by the latter from tubercle bacilli, which forms precipitates in extremely high dilutions with the serum of an animal immunized against the whole protein constituents of tubercle bacilli, but will not itself cause the production of such a precipitating serum. The specific substance has been proved to be a complex carbohydrate, free from nitrogen, having the properties of a gum and on hydrolysis yielding pentoses and a complex nucleus which resists disintegration. The Council believe that the identification of these bacillary constituents formed apparently by the linkage of simple sugars, yet reacting with such exquisite specificity with the antibodies formed in an animal injected with the corresponding whole protein constituents of tubercle bacilli, opens a new and fascinating chapter in immunology.

On another side some striking experiments have been made which show that the infectivity of bacteria is dependent upon what seem quite irrelevant factors acting with them. For some years it has been known that the washed spores of tetanus are quite harmless when introduced into the body. Similarly the bacteria of wound gangrene by themselves are

innocuous. During the war Dr. Gye and Dr. Cramer found that a minute quantity of a calcium salt, a common constituent of soil, acts on the body tissues in such a way that otherwise harmless bacilli become extremely virulent. Silica is nearly as effective as calcium salts. Dr. Gye found a parallel relationship between the infectivity of tubercle bacilli and the effects of silica.

Studies of filter-passing viruses and of cancer have been actively prosecuted during the year under review. Dr. Peyton Rous, of the Rockefeller Institute, New York, had shown that a rapidly-growing sarcoma in a certain breed of fowls was caused by an agent which could pass through very fine filters that would hold back ordinary bacteria. The agent was believed to be a filter-passing virus. Dr. Gye has now provided experimental proof that this opinion is true. He has now shown that the agent in question can be shifted in fluids containing it by very rapid rotatory movement, and is therefore corpuscular; he has also devised means to cultivate the organism artificially and to isolate it for experimental work. But he found that the cultivated and isolated germ could not alone produce a new tumour, but only in the presence of a second factor, a non-corpuscular and therefore non-living and soluble chemical substance which could be obtained from the substance of the previous tumour. The ultra-microbe together with the chemical factor regularly gave a new malignant tumour. Mr. Barnard demonstrated the presence of the microbe by using ultra-violet light, the rays of which have wave-lengths shorter than those of visible light, and thus provided a cross-check on the work of Dr. Gye. The fowl sarcoma described by Rous is conspicuous among all transplantable animal tumours, as being able to yield not only the virus or ultra-microbe but also a substance which determines infection. The microbe can be replaced by microbes obtained from other tumours and from other animals. The Council state that the demonstration of the truth of this is the essential feature of Dr. Gye's work, at this stage at least and so far as the general cancer problem is concerned.

The primary aim of the Therapeutic Substances Bill, which received the Royal Assent on August 7, is to protect the public, both patients and doctors alike, by fixing standards for the strength and purity of complex substances like diphtheria antitoxin, insulin and complex chemical compounds like salvarsan. The arrangements proposed in the Bill closely follow those which have been set up in recent years for testing salvarsan and insulin. The work of preparing certain therapeutic standards, now required by the Act, has been facilitated by international agreements, which have been reached under the auspices of the Health Section of the League of Nations. At the second International Conference, held at Geneva early in September, 1925, agreement was reached with regard to the standards to be adopted for pituitary extract, insulin, thyroid gland, salvarsan, digitalis, and some remedies against parasitic worms.

Dr. Hartley has prepared a standard sample of diphtheria antitoxin, and

the regular issue of samples of this to manufacturers and institutions concerned with the testing of the serum in this country has already begun. This is as yet the only serum for which a standard and a method of assay have been accepted by international agreement under the auspices of the Health Committee of the League of Nations.

In the case of insulin, the National Institute for Medical Research, at Hampstead, has accepted, at the request of the International Conference, the duty of preparing and keeping the international standard of reference. Insulin has been purified by repeated precipitation as a picrate and converted into the form of a dry, stable hydrochloride. This material has been tested in Toronto and in America, as well as in this country, and the results varied only from 8·4 to 8·8 units per milligramme of the dried substance. The International Conference has agreed that one milligramme of the preparation should be taken to contain eight units of insulin.

In last year's report mention was made of a comparative method for the assay of insulin preparations devised by Mr. Marks. There has been some doubt expressed as to whether the laboratory assay ensured uniformity in the clinical effectiveness of different batches of insulin, and with a view to obtaining definite information on this point Dr. Harrison and Dr. Lawrence undertook quantitative tests of the effects of a series of samples on patients with whose response to insulin they were thoroughly familiar. The laboratory and clinical tests showed a correspondence so satisfactory as to warrant the conclusion that a clinical test is not required, and Mr. Marks' test has been accepted by the International Conference as one of the methods suitable for assay made in terms of the standard.

At the request of the Board of Trade every batch of salvarsan, and of any of its derivatives or analogues, issued for use in this country has been tested, under Dr. Dale's supervision, for freedom from toxicity and for therapeutic potency. Special work of this kind has also been undertaken at the request of the Ministry of Health, the War Office and the India Office.

In the section devoted to experimental medicine and the research work of clinical units, the Council state that Dr. Grant has published a report dealing with cases of "effort syndrome." The after-histories of 601 military patients have been followed for a period of five or more years. The death-rate is no greater, but the incidence of pulmonary tuberculosis is 80 per cent higher than in the general population over the same period. The presence of a history of rheumatic fever proves to be of no significant prognostic value in this series. The presence of the syndrome and of the minor cardiac physical signs and symptoms commonly associated with it, does not portend the development of cardiac disease. In other words, it is not an incipient cardiac malady. The report is a valuable confirmation of the soundness of the attitude adopted towards soldiers invalided for this disorder during the period of the war and of the subsequent policy adopted by the Ministry of Pensions.

In the medical unit at St. Thomas's Hospital, London, work on the detrimental effect, if any, of excessive protein diet on renal function was commenced two years ago. Preliminary experiments gave irregular results, but ultimately it was found that albuminuria and other evidences of renal damage were apparently dependent on lack of vitamins, or some other essential constituent of fresh food. Rabbits kept on excessive protein food for long periods showed no renal changes when a very small amount of cabbage was added to the food. There seems to be no evidence that excessive protein feeding as such is at all harmful to the kidneys. The extreme sensitiveness of the kidneys to lack of vitamins may be of great importance in the general treatment of nephritis.

Dr. S. S. Zilva, working at the Lister Institute, has been engaged in the further investigation of the chemical properties of the anti-scorbutic factor. The active principle obtained from a variety of sources can be fractioned by the same reagents as those found effective with lemon-juice. He finds no relation between the amide nitrogen and the antiscorbutic properties of the active fractions.

Dr. Zilva has been superintending the preparation of large quantities of lemon-juice for the stores of the *Discovery* whaling expedition, using the previous knowledge he has gained on the stabilization of the antiscorbutic factor. The juice is being tested periodically, and the results will be compared with those of clinical observations made by Dr. Marshall, the medical officer of the expedition.

With Dr. E. H. Lepper, Dr. Zilva has found that an increased hydrogen-ion concentration or diminished alkali reserve of the blood of guinea-pigs plays no essential part in the development of scurvy in these animals.

Dr. A. Stanley Griffith has continued his researches into different strains of tubercle bacilli from human and animal tuberculosis. He has found a high proportion of bovine tubercle bacilli in the lesions of lupus.

Work on the value of different oils in the treatment of tuberculosis is being continued. It has been found that animal oils are more germicidal than vegetable oils, and that the germicidal power of oils is increased by exposure to the sun's rays.

A study of the serology of the bovine type of tubercle bacillus has confirmed the view that tubercle bacilli of the human and bovine types are not distinguishable by agglutination or absorption of agglutinins.

Professor Möllgaard, of Copenhagen, has recently introduced a complex salt of gold and sodium—sodium aurithiosulphate—under the name of "sanochrysin" as a treatment for tuberculosis. The first clinical trials seemed to show that the drug exerts a specific action on tuberculous tissues and further clinical trials have been instituted. Colonel S. L. Cummins has failed to cure rabbits after virulent infection with bovine tubercle bacilli by subsequent treatment with sanochrysin. Sir Almroth Wright concludes from his experiments that sanochrysin exerts no direct bacteriological effect upon the bacilli in human tuberculous lesions.

Experimental investigations into pneumonia by Dr. Gaskell has produced further evidence that the kind of damage produced in the lung depends upon the virulence of the infecting organisms and not upon the dosage of infection given, if the dose does not fall below an effective minimum.

Dr. M. H. Gordon has continued his studies of the viruses of vaccinia and variola. He has shown that in all the essentials of the immunity reactions in which the virus can be made to play a part, these are closely analogous to those elicited by the better-known pathogenic bacteria. The virus of vaccinia is particulate though invisible by ordinary means; it can be thrown down from its clear suspensions in fluid when it is exposed to specific agglutinating antiserum. In the absence of any wound the easiest mode of access to the animal body by the virus is through the lining membrane of the nose. The possibilities of producing immunity by way of this membrane are now being investigated.

Dr. Gordon has examined various brands of calf-lymph, and his results seem to show that, while the specimens vary among themselves as regards their individual charges of virus, there is no evidence of the existence of more than a single type of vaccine virus.

The viruses from various outbreaks of small-pox in different parts of the country have been compared by strict serological methods and they all gave positive reactions with anti-vaccinia serum. No difference in this respect was found between the mild type of small-pox, sometimes called alestrim, and that from severe examples of the disease. Comparable material from six outbreaks of chicken-pox gave negative results with anti-vaccinia serum, and there seems to be good reason to believe that the serological method will give valuable aid in future in the diagnosis of small-pox.

The principal investigations on canine distemper are being carried out at Mill Hill, in the Farm Laboratories of the National Institute. It has been found that ferrets can be conveniently used for much of the experimental work. Distemper in ferrets and dogs is the same, but other kinds of animals have not yet been found susceptible to the disease. The virus has not yet been isolated or cultivated *in vitro*, but it has been clearly shown that the infective agent exists in material from which none of the ordinary bacteria can be grown. The extreme infectivity of the disease has been demonstrated, and there are strong indications of the transmission of air-borne infection, at least over short distances in an enclosed space.

From a study of the immunity-reactions of the virus of herpes, Dr. Perdrau concludes that the virus of herpes is identical with the causal agent of encephalitis lethargica, and that the failure of workers to infect susceptible animals with the latter is probably due to the presence of an antibody in the infected brain-tissue. This conclusion was tested during the year and confirmed by the demonstration of the herpetic virus in the brain of three fatal cases of encephalitis lethargica. An antibody formed in

response to inoculations of the herpetic virus has been found to neutralize *in vitro* comparatively large doses of the virus.

Dr. Hume and Dr. Kirkhouse, working upon the effects of diuretic drugs, have shown that these drugs are of little use in the treatment of dropsy due to nephritis, being unnecessary in mild cases and ineffective in severe ones. In œdema, due to heart failure, some diuretics can be used with advantage, for instance, digitalis when the failure is due to auricular fibrillation, and caffein when the heart rhythm is regular.

With the object of confirming and extending the work of the Dicks in America, a research on scarlet-fever has been organized. It was found that the toxin of *Streptococcus scarlatinæ* could be precipitated with alcohol and then retained its properties unimpaired over long periods of time. Studies were made with this toxin and by means of intradermal injections individuals were classified into immunity groups. Young children are highly susceptible to the toxin, while adults are resistant to it. On the other hand, most children who have suffered from scarlet fever show a resistance equal to that of adults. At the Lister Institute, at Elstree, an antitoxin has been prepared in a concentrated form and made available as a prophylactic and therapeutic agent.

Studies in experimental epidemiology have been continued by Professor Topley and Dr. Major Greenwood, who have shown that pasteurellosis in mice will continue indefinitely on the sole condition that the population at risk is replenished by susceptible but non-infected animals. The mortality of such a population shows wave-like reinforcements. When the immigration rate is low the intervals between the waves of mortality are longer, but when the rate is high the intervals become very short and tend to become merged into a steady high level of mortality. It is obviously not true, at least so far as pasteurellosis in mice is concerned, that an infectious disease can be brought to a standstill in an infected community by rigorous exclusion of infected immigrants. It is suggested that this experimental work may give new guidance in the study and in the practical control of natural epidemics.

Clinical and other Notes.

BILATERAL DISPLACEMENT OF THE SCAPULÆ.

By Major W. T. GRAHAM, O.B.E.
Royal Army Medical Corps.

A case of pronounced deformity resulting from elevation and forward displacement of both scapulæ is at any time somewhat of a rarity, but when the condition is discovered in a soldier of close on seven years' service it would appear so unusual as to be worthy of being placed on record.

The patient, a corporal in an infantry regiment, aged 25, service six years and ten months, first came to my notice in February, 1925, when he was in the British Station Hospital, Secunderabad, for a fortnight on account of a contusion of the right shoulder, the result of a fall from the parallel bars while exercising in the gymnasium. At that time it was noticed that owing to a pre-existing malformation of his shoulders he was unable to elevate his arms above the horizontal. In September of the same year he reappeared complaining that he found the disability due to his deformity increasing.

There is nothing in the family history indicating that the defect is hereditary or due to injury at birth. His father is alive and well at the age of 63. His mother died, aged 53, from meningitis following erysipelas. He is one of a family of thirteen. All his brothers and sisters, as far as he knows, were normal; one brother was killed in France and one died at the age of 32 from "heart disease," said to have followed an attack of rheumatic fever at the age of 12. He himself is married and has two normal children, aged 3 and 6 respectively.

He states that he has always been healthy, the only illness he can recall is an attack of influenza at the age of 14, on account of which he attended a dispensary for three weeks.

On December 31, 1918, he enlisted in London, and according to his own statement there was then absolutely no limitation of the movements of the arms, nor is there at that date any note in his medical history sheet of the defect.

He states that in the summer of 1920, while acting as drill instructor at his regimental depot, he first noticed difficulty in elevating his outstretched arms; the difficulty has steadily increased since that time, also his shoulders have become rounded and sloping.

On examination he is seen to be a well-developed man of average height. A feature which strikes the eye at once is the narrowness of his shoulders, an appearance which is enhanced by the fact that the outer extremity of the shoulder girdle on either side is thrown forward, and by the conical shape of the neck due to the tightly stretched elevators of the

scapula. His chest fully expanded measures thirty-four and a half inches, which is much below the average for a man of his height, which is five feet nine and a half inches. The range of expansion is only two and a half inches. On enlistment his chest measurement was thirty-four inches and the expansion three inches.

On examining the back with the arms hanging at rest by the sides, the scapulæ are found to be raised and their superior angles carried forward so that they come to lie three-quarters of an inch above and one and a quarter inches behind the posterior borders of their respective clavicles. A line joining the superior and inferior angles instead of being almost vertical with a slight lateral inclination at its lower end slopes towards the spinal column. The vertebral borders are prominent. The inferior

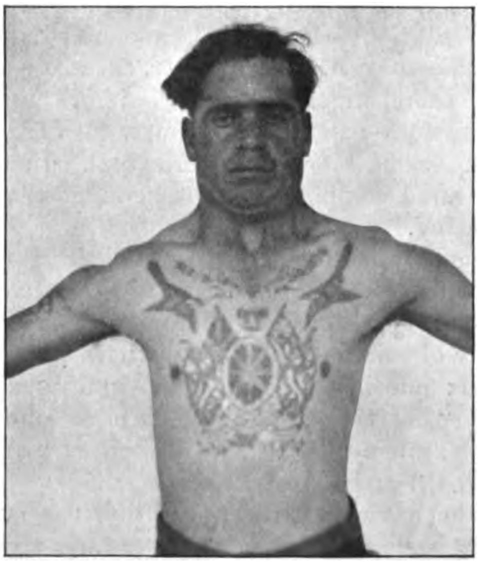


FIG. 1.—Front view showing the muscular strain involved in elevating the arms and the hypertrophy of the neck muscles.

angles only reach the level of the fifth intercostal space. The lower portion of the trapezius on either side is poorly developed and the rhomboids, so far as can be ascertained by superficial examination, are also weak. The muscle showing the greatest amount of atrophy is the serratus magnus, the digitations of which cannot be traced on the surface.

Owing to the displacement of the scapulæ the glenoid fossæ with the overhanging acromion processes are inclined downwards and forwards, thus limiting upward movement of the humerus. The arm cannot be raised through more than an angle of eighty degrees either in a lateral or anterior direction, the scapula commences to rotate when an angle of forty-five degrees is reached.

The neck when at rest is bent forward owing to the drag of the shoulders which can only be braced back by a considerable muscular effort. There is a marked tendency in the neck muscles to compensatory hypertrophy. A definite scoliosis exists, the convexity of the dorsal curve being to the left; this may have been present before the other deformity commenced to develop.

The accompanying photographs will serve to illustrate the exact nature of the deformity.

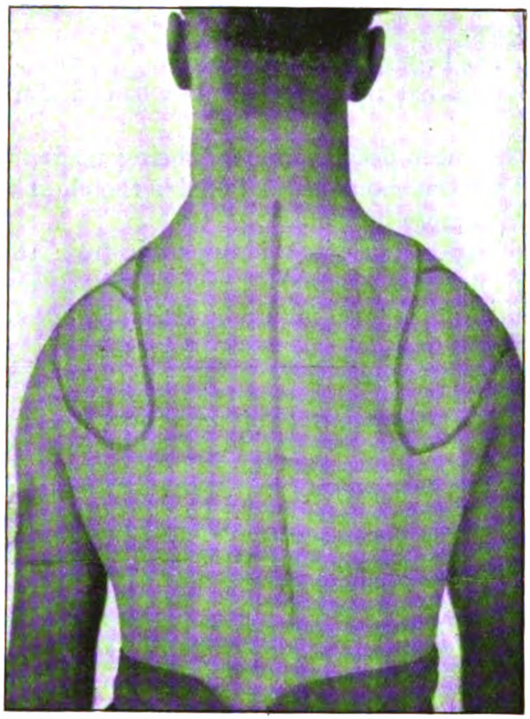


FIG. 2.—The scapula has been outlined in order to show the extent of the deformity. The spinous processes of the thoracic vertebræ have also been outlined.

Radiography confirmed the position of the scapulæ outlined in fig. 2.

There are no signs of interference with the nerve supply to the affected muscles, fibrillation is absent and their electrical reactions are unaltered. A similar displacement of the scapulæ might have resulted from partial destruction of the nerve supply to the trapezius, but as there is nothing to indicate any lesion of the nervous system this is not the explanation. The long thoracic nerve is also unaffected and the prominence of the vertebral borders of the scapulæ does not amount to a condition of winged scapula.

At first sight the distortion of the shoulder girdle is so striking and the signs of muscular deterioration so limited that one naturally thinks of con-

genital elevation of the scapula, or Sprengel's shoulder, as a possible explanation of the condition. A moment's consideration will, however, convince us that this theory is untenable in face of the history of gradual onset during the past five years, backed as it is by the evidence of his medical history sheet that there was no disability on enlistment.

It would appear, therefore, that the man is suffering from a myopathy, or dystrophy, affecting a very limited group of muscles, and resulting in a compensatory hypertrophy of others. An unusual feature of the case being the entire absence of any hereditary tendency to the disease as evidenced by the family history.

The condition has begun somewhat late in life, and the progress up to date has been slow, so that the prognosis may be considered comparatively good.

An appliance has been designed, and is being made locally, which it is hoped will brace back the shoulders and enable the chest to expand and the arms to be used with more freedom.

That the disability is not great is apparent from the fact that he is still performing his duties as a soldier, and on his return to civil life it should not prevent him from taking up his former trade of printer.

Echoes of the Past.

No. 3 GENERAL HOSPITAL, B.E.F.

By Colonel S. F. CLARK (R.P.).

The unique record held by No. 3 General Hospital, B.E.F., appears to be worth a passing thought, for not only is it the sole hospital of its class in being of those which mobilized and went overseas in August, 1914, but it is also, I believe, the only medical unit formed at the outbreak of the Great War which until quite lately was functioning as the Military Hospital, Langenfeld. Moreover, it is probable that never before has a British hospital spent nearly eleven years outside the Empire, as a direct consequence of hostilities. These points seem to possess some historical interest for our Corps, and especially to those who served in the unit.

No. 3 came into being at the little village of Burscough, in Lancashire, on August 5, 1914, the first day of mobilization, and except for one officer it was complete five days later. His absence caused the report of absolute readiness to be delayed until the 12th inst., when it was found that he had been among the early arrivals, but had joined another unit which was mobilizing at the same place. This misunderstanding deprived No. 3 of the honour of being the first General Hospital to complete its mobilization, but it shared the distinction with No. 2. This fact is to be found in the "Official History of the War, Medical Services," which also records that

Nos. 2, 3 and 7 all embarked for France on August 14, and were preceded only by a Stationary Hospital, which left on the 13th. No. 3 thus went overseas before any of the field ambulances, cavalry field ambulances, clearing hospitals, stationary hospitals (less one) or the other nine general hospitals. It arrived at Rouen on the 15th, and was the first medical unit of any kind to reach that place. The *Maison de Repos* was handed over to it, and the unit was instructed to be fully open by the 20th—an order which was easily carried out, as patients could have been received within twenty-four hours had it been necessary.

The hospital very quickly lost sixty of its 520 beds, for twenty were ordered to be sent to each of two buildings where they were to be taken over by other *personnel*, and the twenty for officers, with all the equipment for patients of commissioned rank, were directed to be forwarded to the

Collège de Garçons, St. Nazaire—Occupied by No. 3 General Hospital, B.E.F.

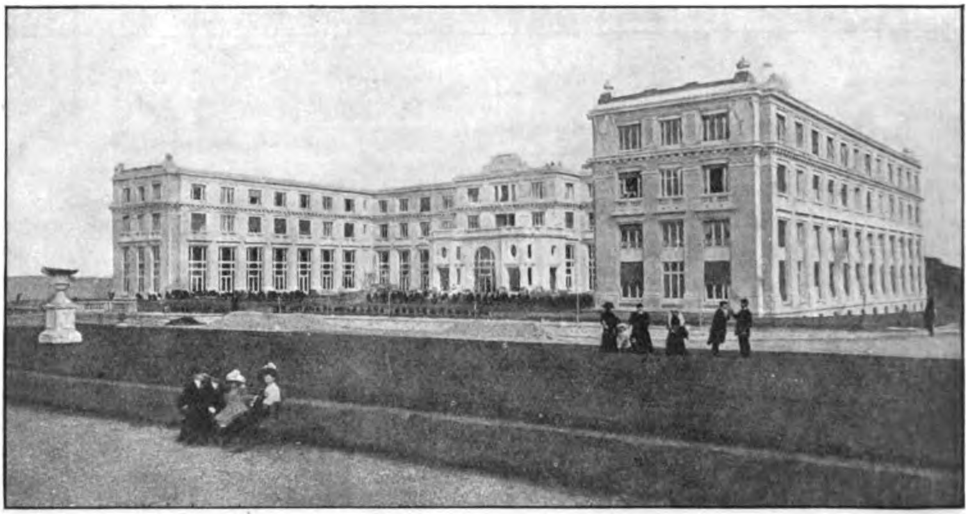
Grand Seminaire, which was to accommodate 100 officer patients. It was pointed out that this loss of special epuipment would seriously hamper No. 3 in dealing with officer casualties, but an assurance was given that none would be sent to it, so No. 3 felt aggrieved when about thirty wounded officers arrived a few days later, and were admitted.

The bottom soon fell out of another arrangement also, namely, that cases that would be fit to report for duty within one month were not to be sent to England. It was soon obvious that, to enable the hospital to carry out its primary function of taking in all cases that were sent to it from the ambulance trains, wholesale evacuations would have to be made, and strict attention to certain orders and regulations be discarded. It is to the credit of the M.O.s of those hectic times that they had the moral courage to sweep aside the training, and the adhesion to regulations, of peace time,

which had become a second nature, and to do those things which the situation demanded.

The building was not large enough to take all the beds—especially as those that were found in it were used—so many marquees were pitched in the grounds, and just as they had been floored with wood, and other improvements were well in hand, the hospital was ordered to pack up for embarkation to an unknown destination. This was a crisis in the history of the unit, as for a long time it looked as if the congestion at the quay would prevent the equipment from being loaded on to the ship before it sailed, and it was only a "will to win" that averted such a calamity.

The hospital left Rouen at noon on September 1, 1914, and came alongside a wharf in the harbour of St. Nazaire on the evening of the 4th, when



TRIANON HOTEL, LE TREPORT.—Occupied by No. 3 General Hospital, B.E.F.

the derrick men did only one hour's unloading, but the unit had a camp hospital in going order within twenty-four hours, in a field over one mile away, in spite of miserably inadequate transport facilities.

This camp hospital continued to function until September 10, when it moved into the Collège de Garçons, and handed over its camp site to No. 6 Stationary Hospital. For about the first week of the change of base, No. 3 was the only hospital of the B.E.F. that was at work at St. Nazaire, in fact, according to the "Official Medical History of the War," until about September 12 no other hospitals were open in France, except No. 9 General and Nos. 1 and 5 Stationary Hospitals, and the first-named of these two smaller units was not ready till the 10th. No. 3 had also got well ahead of Nos. 2 and 7, which had left England on the same day as it had done, for the equipment of No. 2 had gone back to England instead of being disembarked at St. Nazaire, while No. 7 had been broken up.

These mishaps gave No. 3 an unassailable position in regard to unbroken continuity of service on the continent of Europe. At the end of the advance to the Aisne the only hospitals open on the lines of communication were Nos. 3 and 9 General, and Nos. 5 and 6 Stationary, with No. 9 Stationary employed in rest station duties, and No. 10 Stationary apparently taking in patients and also acting as a railway rest station.

No. 3 carried on its duties at St. Nazaire until November 19, 1914, when it left by rail for Rouen. Every other unit of all arms had preceded it, and its C.O. had been formally appointed British Commandant at this base, with responsibility for the maintenance of good order in the town, as far as any troops of the B.E.F. were concerned.

The hospital did not open at Rouen, but after remaining there for a few days it went on by train to Le Treport, where it took over the magnificent Trianon Hotel, and was ready for work early in December. For several months it had this place to itself, and enjoyed a large measure of independence, but other units arrived later and Le Treport eventually became a large medical centre. It is difficult to believe that any other hospital in France was housed in a more imposing building than the Trianon, but it is reported that the roof of this fine hotel is falling in, and that the structure has remained unoccupied since the war ended.

No. 3 remained at Le Treport until March, 1919, when it moved to Langenfeld, near Cologne, for duty with the British Army of Occupation, and up to at least April, 1922, it was still a General Hospital, with 300 beds, and had outlived all its colleagues of 1914; one man was still on its strength who had served continuously with the unit since its mobilization. At the time of writing (April, 1925) No. 3 has not yet closed its doors, but is now called the Military Hospital, Langenfeld.

Between personnel and patients an amazing number of names of individuals must have figured on the books of this hospital since August, 1914.

Current Literature.

Acute Food Poisoning. *British Medical Journal*, vol. i, 1925, p. 373.—Bacterial food poisoning in this country is almost invariably due to infection of food with bacteria of the salmonella group, such as set up acute gastro-intestinal irritation revealed by vomiting and severe diarrhœa. The more serious form of food poisoning, botulism, is of an altogether different character and is fortunately extremely rare in these islands. The group of microbes now spoken of as the salmonellas may be more familiar to some readers by another name, such as the Gaertner group or the paratyphoid-enteritidis bacteria. The name "Gaertner group" was satisfactory whilst we thought that the *Bacillus enteritidis* of Gaertner was the commonest or most important member of the family;

but when later it became apparent that this title was inadequate and misleading, the food-poisoning bacteria were more frequently referred to as the paratyphoid-enteritidis group—a cumbersome denomination from which we have been delivered by a further advance of knowledge which separated the paratyphoid bacteria proper from the common agents of food poisoning. The hitherto less popular name, "salmonella," has been kept alive by some bacteriologists from the beginning, and now seems the most suitable appellation, in spite of the fact that it may erroneously suggest some connexion with salmon, and so give the impression that this fish is particularly associated with food poisoning. The name salmonella has fewer drawbacks than any, and possesses historical justification, being the first name these microbes received. It was, we believe, originally proposed by Lignieres, after Dr. Salmon, who isolated the bacillus of hog cholera.

The salmonella bacteria have always been a troublesome genus to the bacteriologist. Alike in morphology, and almost alike by common culture tests, the members of this group can only be distinguished from each other by agglutination reactions. Serological tests easily separate Gaertner's bacillus from the paratyphoid group, but great skill and patience are needed to distinguish the individual paratyphoid bacillus A, B and C from *Bacillus aertrycke* and *Bacillus suipestifer.* The ultimate court of appeal, the agglutination absorption test, has discriminated a steadily increasing number of new types of paratyphoid bacilli, given different names by different workers, thereby adding to the confusion.

We welcome the Medical Research Council Special Report, No. 91, entitled "An Investigation of the Salmonella Group, with Special Reference to Food Poisoning," chiefly because it contains important information about the distribution of the food-poisoning bacteria and the way in which they act, and we are glad also that it gives an authoritative lead in terminology. This is found in the first part, which records the serological studies Mr. Bruce White has carried out on the classification and behaviour of bacilli of the salmonella group. We do not propose to enter into the details of these experiments, though they are of much technical interest, but observe in passing that Mr. White's conclusions support Dr. Schutze's classification, even if they call for some eliminations and the addition of at least one new type. He distinguishes *B. enteritidis*, *Bacillus paratyphosus* A, *Bacillus paratyphosus* B, *B. aertrycke* (four types), *B. suipestifer* (including *B. paratyphosus* C and the hog cholera type), and *Bacillus abortus equi*.

In the second part of the report Dr. Savage and Mr. White arrive at some very important conclusions about the distribution and disease-producing powers of the different members of the salmonella genus. *B. aertrycke* is the commonest agent of food poisoning in man; it causes enteritis in mice, guinea-pigs, rats, birds and calves. The paratyphoid B bacillus does not cause food poisoning; it possesses no irritating toxin; though responsible for paratyphoid fever in man, animals are not so susceptible to this infection. Gaertner's bacillus causes food poisoning in

man and illness in animals, notably cows and rats. *B. suipestifer* has a low virulence for man, and can cause food poisoning only in exceptional circumstances; occasionally it is a primary cause of disease in pigs, but usually only a secondary invader of pigs suffering from hog cholera. These views contradict many oft-repeated statements about the paratyphoid B bacillus and the suipestifer bacillus, but they bring a welcome order into this ill-assorted group. The scheme which the Ministry of Health promoted early in 1921 for the investigation of outbreaks of food poisoning has given Dr. Savage unique opportunities for the study of the salmonella bacteria, but we need not accept his views out of deference to his experience alone, for in the third section of the report we come across some experiments which will be impressive to the unconvinced.

Outbreaks of acute gastro-enteritis due to canned foods are usually characterized by rapid onset and rapid recovery; no pathogenic bacteria can be isolated from the sufferers or from the food, and the blood-serum does not as a rule show agglutinins for the salmonella bacteria. Feeding experiments by giving the peccant food to animals yield negative results, but by inoculating animals with the food it is sometimes possible to work up low titre antiserum for salmonella bacilli. The essential feature, therefore, appears to be the existence of a toxic substance having a local irritant action, and to investigate this Dr. Savage and Mr. White adopted the plan of feeding young rabbits with large doses of salmonella bacilli, and killing them after six to eight hours to observe the appearance of the stomach and intestine. In this short interval no symptoms appeared; there was no diarrhœa and no vomiting. When *B. aertrycke* or Gaertner's bacillus was given by the mouth to animals, using either living germs, or cultures killed at 60° C., or cultures boiled for ten to thirty minutes, a well-marked irritant action on the stomach and duodenum was noticed; in some cases the stomach was violently inflamed, much swollen, and showed many petechial hæmorrhages. Dr. Savage and Mr. White obtained a strong impression, which, however, could not be definitely confirmed, that the heating of suspensions of the aertrycke bacillus and Gaertner's bacillus tended to accelerate the irritant action of the alimentary tract. No such irritant action was noticed after feeding animals with cultures of the paratyphoid B bacillus.

Both Mr. White and Dr. Savage thought to confirm these results by experiments on themselves. Mr. Bruce White observed sensations of tingling and a rash with injection of hair follicles when cotton wool pads soaked in emulsions of aertrycke bacillus were strapped on his arm, but no definite reaction with the paratyphoid B bacillus. Dr. Savage consumed an emulsion of an agar slope of the paratyphoid B bacillus, heated at 66° C. for thirty minutes, and another heated at 100° C. for twenty minutes, and noticed no irritant action on the alimentary tract. From these experiments they conclude that heat-killed salmonella bacteria, particularly those responsible for food poisoning, exert a marked irritant

effect on the intestines; this irritant action is slight or absent with paratyphoid bacilli B and C. The irritant action is local and independent of the immunity of the animal to invasion by the living microbes.

These and other experiments recorded in this report must lead to a revision of views about some of the food-poisoning bacteria. It seems that the paratyphoid B bacillus ought not to be included in this group. Under natural conditions it only attacks man and causes paratyphoid fever only. It differs from the true food-poisoning bacteria in not possessing the same irritant effect on the bowel, and in the fact that it readily penetrates the intestinal barrier and can be found in the blood. The longer incubation period and gradual onset of paratyphoid fever afford clinical evidence against local irritant action. Outbreaks of food poisoning alleged to be due to paratyphoid B were in reality caused by some other microbe. *B. aertrycke* and Gaertner's bacillus have a wide range of natural hosts, including man, mice, rats and most domestic animals. They differ from the paratyphoid B bacillus in possessing marked irritant action on the bowel and in not invading the tissues of the body in man, though they are markedly invasive for other animals; the low agglutination titre of the blood of patients suffering from infections caused by *B. aertrycke* and Gaertner's bacillus is explained by the lack of general invasion. The toxin which these bacteria form when living in food is not destroyed by boiling. For *B. suipestifer* the pig is the natural host, and it still remains to be decided whether it and the paratyphoid C bacillus are separate organisms. Probably the suipestifer bacillus is frequently ingested by man, but only one outbreak of food poisoning in England has been definitely traced to it; in this outbreak, investigated by Dr. Savage, cheese was the offending article.

To sum up, probably three-quarters of the outbreaks of food poisoning in England are due to the aertrycke bacillus, and the low death-rate (about 1 per cent) may be explained by the low invasive power of this bacillus. Next in importance is Gaertner's bacillus, which causes a more serious infection as a rule. Other salmonella bacteria play a very small part, if any, in acute food poisoning.

The Differentiation of Food-poisoning Bacteria. By Brown, Duncan and Henry. The *Lancet*, January 16, 1926.—The authors of this paper emphasize the difficulties that beset the worker in small laboratories who is called upon to investigate the bacteriology of an outbreak of food poisoning, but does not possess the mono-specific serum that will enable him to prove the identity of pathogenic microbes isolated from the patient's dejecta, and from the articles of food causing the outbreak. The "sugars," it is stated, will help him to some extent, but the "sugars" fall short of the differentiation of many members of the salmonella group. The authors, therefore, urge the use of certain organic salts for the purpose of differentiating the salmonellas; these salts are the sodium salts of citric, d-tartaric, l-tartaric, m-tartaric, fumaric and mucic acids.

They are employed in a peptone water medium in a concentration of one per cent, and they are not materially affected by sterilization in the autoclave. The cultures in the salt media are incubated at 37° C. for forty-eight hours, and decomposition of the salt is then investigated by adding a sufficient quantity of a soluble lead salt; 0·6 cubic centimetre of a saturated solution of lead acetate to every 5·0 cubic centimetres of the tartrate medium, or 0·5 cubic centimetre to a similar quantity of the citrate medium. All the acids mentioned when undecomposed yield insoluble lead salts and, with the exception of fumaric and mucic acids, the precipitate caused by the addition of lead acetate is bulky and tends to remain in suspension, forming a white flocculent column.

On adding the precipitant, decomposition of the salt is shown by the formation of a slight granular greyish-white precipitate composed of lead carbonate which sinks rapidly to the bottom of the tube.

With fumaric acid the lead salt forms a slight heavy precipitate quite unlike that given by the other acids. In the case of mucic acid, precipitation by lead also yields a small heavy precipitate; this can be distinguished from the lead carbonate in the tubes, in which decomposition of the salt has occurred, by adding a little acetic acid, when the lead carbonate will be dissolved, but not the lead mucate.

Readers are referred to the *Journal of Hygiene*, 1924, vol. xxiii, 1, for a more detailed account of the technique of the tests.

It is claimed that in the case of each organism tested the result of the action on the organic salts was directly correlative with the serological findings. A table is given showing the actions of the various salmonellas on the six salts above mentioned.

The only member of the salmonella group that gave inconstant results with the organic salts is *Bacillus enteritidis* (Gaertner). It has not been found possible to differentiate the various cholera-like vibrios from true *Vibrio cholera* by means of salt fermentations.

Reviews.

OFFICIAL HISTORY OF THE CANADIAN FORCES IN THE GREAT WAR: MEDICAL SERVICES. By Sir Andrew Macphail, Kt., O.B.E., etc. Ottawa: F. A. Acland. 1925. Pp. vii + 458. One map.

Sir Andrew Macphail's volume on the Canadian Medical Services during the Great War is the first of the official volumes on the history of the Canadian Forces. Previous to the war the Canadian Medical Services consisted of 20 officers, 5 nursing sisters and 102 other ranks of the permanent army. In addition there was a militia organization of 6 cavalry field ambulances, 15 field ambulances and 2 clearing hospitals with medical officers for each combatant unit of militia. Within a month after war was declared a regimental medical service for every unit of the

Expeditionary Force was organized as well as 3 field ambulances, 1 casualty clearing station, 2 stationary and 2 general hospitals, 1 sanitary section and 1 advanced depot of medical stores. These constituted the establishment of a division in the field; but before the war ended Canada sent overseas, in addition to this initial service, 1 cavalry field ambulance, 10 field ambulances, 4 sanitary sections, 3 casualty clearing stations, 4 stationary and 14 general hospitals, 7 special and 8 convalescent hospitals, 2 laboratory units, 3 depots of medical stores, and 2 hospital ships. Including regimental medical officers, medical boards and a training school, the medical personnel overseas reached a total of 1,528 officers, 1901 nursing sisters and 15,624 other ranks exclusive of reinforcements. The number of troops for which this provision was made was 418,052, the number of sick and wounded treated was 539,690 of which 144,606 were battle casualties. The hospital accommodation had a capacity for 36,609 beds. In Canada itself there were in addition sixty-five medical units with a bed capacity of 12,531. They admitted 221,945 patients. These figures represent the effort of the Canadian Medical Services and everyone who came in contact with the overseas units will bear witness to their efficiency and to the keenness of their personnel. Of the latter, 30 officers and 528 other ranks were killed or died while serving. Seven dental officers died and ten dental other ranks were killed in action or died of disease. Fourteen nursing sisters were drowned when the "Llandovery Castle" was torpedoed on June 27, 1918; 1 other sister was drowned and 6 were killed or died of wounds and 18 died of disease.

The history as a whole presented to us by Sir Andrew Macphail does not enter into much detail of the work of the medical services in the various areas of operations in which they took part. Only sixteen pages are devoted to the battles of the Somme, Vimy Ridge and Passchendaele, one and a half to Neuve Chapelle and the first gas attack in the Ypres salient, and two and a third to the Festubert and Givenchy battles in 1915. Yet in all these operations the Canadian Medical Services played a gallant and conspicuous part and won two Victoria Crosses. One would like to have a more detailed and interesting record in a history of this kind of individual experiences. In like manner the work of the medical services during the advance to victory and the Rhine is dismissed in twelve pages. Fortunately Colonel Snell in his account of the Canadian Army Medical Corps with the Canadian Corps during the last hundred days of the war supplies a much needed want of individual experiences and of information regarding the employment of the regimental medical services and divisional medical units during these final operations. Canadian medical units also were employed in connexion with the operations of the Mediterranean Expeditionary Force and with the Siberian Force, of which very little has been heard. Sir Andrew Macphail, however, does not tell us much about these. Indeed he seems scarcely to have realized the relationship of Mudros to Alexandria and Malta as bases for the operations on the Galli-

poli Peninsula, for he speaks of the conditions as recalling the events of Crimean days and of the base to which patients could be sent being six weeks distant. He also states in connexion with the Gallipoli campaign that ninety-five per cent of the personnel developed enteritis mainly of the amœbic variety. Eighty per cent of the cases, he says, were amœbic. Subsequent investigation, however, tends to show that amœbic dysentery occurred only in a very small percentage of the British troops although it was more prevalent among the Indians. In this and in some other directions the statements in the volume do not appear as accurate historically as one might expect from the author. For example he notes that it was only during the period of stationary warfare that the medical services operated on normal lines. As a matter of fact it was only during the periods of war of movement in 1918 that they operated normally as laid down in Field Service Regulations. Again the agreement after Dettingen can scarcely be regarded as the origin of the Geneva Convention. It is true that the opposing belligerents agreed then to avoid firing on the hospitals, but this was only one of a large number of similar agreements during the wars of the eighteenth century and earlier, and the real origin of the Convention and the Red Cross emblem was the campaign carried on in Europe by Dunant after the publication of his *Souvenir de Solferino* two or three years after the battle. It is equally incorrect to state that the casualty clearing station came into being during the South African war. The history of its origin is clearly recorded in the first chapter of the first volume of the "Official General History of the Medical Services during the Great War." It was not until 1907 that its introduction into War Establishments was considered by the War Office.

But these defects in Sir Andrew Macphail's history do not detract from the great interest which every reader must feel in the literary excellence of the volume and the vigour and force of his denunciation of political and personal interference with medical services. An attack on the medical services by personalities and politicians in time of war is not an uncommon experience. Indeed, an abortive attempt was made in March, 1916, in Parliament to vilify those in high responsible positions in connexion with the British Medical Services in France. In Canada a similar and far-reaching attack was made on the administration of the Canadian Medical Services. Sir Andrew Macphail does not spare those who originated it and carried it on, and, in so doing, he adds a new record to the long list in past history of the manner in which medical services are marked out as the objects of "surmise, suspicion, and inuendo," and as a "temptation for the mingled motives of pride, chagrin, or malice." His opening chapter, to which he gives the title of "The General Theme," develops his views regarding the conflict between the military and the civilian element and the way in which the latter failed in Canada to appreciate the requirements of the former and undertook its control with disastrous results. He devotes many subsequent pages to the controversy that arose

in Canada in 1916 in connexion with the medical services, and that led to the downfall of the Minister of National Defence. In fact, this portion of the volume is its chief feature from an historical point of view and overshadows other interesting details. It is unnecessary to refer further to this controversy except to say that it arose from the politician's desire to segregate and isolate Canadian sick and wounded for treatment in Canadian medical units only, and that the administration introduced to give effect to this was subsequently reversed after proving to be a failure and after being condemned by a board presided over by the late Sir William Babtie.

In closing this review of a volume of conspicuous literary merit and courageous expression of opinion we would take the opportunity of correcting the figures, given in the Appendix of Vol. IV of the Official General History of the Medical Services, relating to honours and rewards to the Canadian Medical Services, as these do not agree with the figures in Sir Andrew Macphail's volume, which must be taken as more authoritative as regards his own service. According to him the Canadian Army Medical Corps gained 49 D.S.Os., 158 M.Cs. with 19 bars, 344 M.Ms. with 15 bars and 34 D.C.Ms. The Dental Corps obtained 2 D.S.Os. In Vol. IV of the Official General History these figures are given as 38 D.S.Os., 130 M.Cs. with 15 bars, 56 M.Ms. and 7 D.C.Ms. In other respects the figures in the two histories agree.

A List of Medical Officers of the Army, 1660 to 1727. Compiled by Colonel Alfred Peterkin, C.B., M.A., M.B. Aberdeen: The University Press, 1925. Pp. viii + 38. Price 10s. 6d.

Colonel Johnston's monumental Roll of Officers of the Medical Service commences with the year 1727, but a standing army was created in 1660 on the restoration of Charles II to the throne. It was at first a small army of 5,000 men to which medical officers were commissioned as surgeons with warrant officers as surgeon's mates. Colonel Peterkin has consequently supplemented Colonel Johnston's roll by compiling a list of those who received commissions from the date of the creation of a standing army to the date of the commencement of Colonel Johnston's roll. In doing so he has undertaken a task of considerable magnitude and has produced a document of much historical interest. The names of the officers in his list and of the regiments to which they belonged excite the imagination to an unusual degree in compilations of this nature. The period, too, covers the time of the Royalist wars, with the Battle of Sedgemoor, the Scottish Rebellion, with the Battle of Killiecrankie, and Marlborough's campaigns, with the Battles of Blenheim, Ramillies, Oudenarde and Malplaquet. During much of that time it is interesting to find in Colonel Peterkin's list a large number of medical officers with foreign, chiefly French, names. The very first on the list is James Des Fontaines, who was Surgeon-General to the Forces in Ireland, and there are also names such as Choques, Hubin, Coudroy, Brullehan,

Fourcade, Gerardo, Buissiere, Colladen, Debize, Malfaquerat, Desquier, and many other foreign names amongst the 617 on the list. The designation of the regiments are equally suggestive as they retained the names of the noblemen and others who raised them. Many were disbanded, such as the King's Own Scottish Horse, commanded by Graham, of Claverhouse, which was disbanded on the outbreak of the Scottish Rebellion in 1689. In other cases Colonel Peterkin adds to the interest of the list by noting the numerical designation, which was subsequently given, and under which the regiments became famous in later years.

Scarcely any of the names of the medical officers have gone down to history. One only, Sir Theodore Colladen, who was physician to the Chelsea Hospital from 1694 to 1702, was knighted. He was a native of Belgium and a Walloon. But there were two baronets, Sir Edmund Garth, physician to the land forces and physician-in-ordinary to George I, and the famous Sir Hans Sloane, whose name decorates to-day more than one fashionable London street. He also was Physician-General to the land forces, became President of the Royal Society and initiated the British Museum. Amongst other interesting names on the list is that of Dr. Thomas Lawrence, who held many appointments in the army and was the only brother of Henry Lawrence, Lord President of the Council to Oliver Cromwell. Another is that of Thomas Gibson, who married the daughter of Richard Cromwell. Two medical officers, Sackville Whittle and Thorowgood Meautys, are noted as having been buried in Westminster Abbey. One, Dr. John Hutton, was made a Fellow of the Royal Society in 1697. A surgeon of the 2nd Life Guards, Charles Peter, wrote pamphlets on venereal disease and on his own anti-venereal pill. Only one officer is noted as having been killed in action—John Whitfield, of Colonel Stanley's (16th) Foot, at Blenheim, but another, Thomas Wilson, is described as having died in 1711 "from barbarous usage of enemy when a prisoner." These are only a few of the notes that add to the interest of Colonel Peterkin's list.

The list is probably not complete. We would have expected to see the name of Richard Wiseman in it. Sir Thomas Longmore published a biographical study of his life in 1891. He accompanied Prince Charles after the defeat of the Royalists, was attached to the Guards, and was appointed principal surgeon and serjeant-surgeon in 1671 or 1672. The only other criticism we would venture to make of this able compilation is that it would have been less open to remark if the footnote on p. 16, "King William killed, March 8, 1702" indicated that he was killed by a fall from his horse. We recommend the book as one of historical interest, not only to the Royal Army Medical Corps, but also to all those interested in military and military medical history.

Reports and Analyses.

BISTOVOL.

BISMUTH ACETYLAMINO-OXYPHENYLARSENITE.

LEVADITI, in a paper on the chemotherapy of syphilis, which appeared in *The Lancet* for January 30, 1926, reported favourably on a new compound containing bismuth and arsenic, namely, basic acetyloxyaminopheny arsenate of bismuth.

Fournier and Schwartz, writing in *Comptes Rendus de l'Académie des Sciences*, June 22, 1925, report that this drug is tolerated perfectly well, and has none of the disadvantages met with in the use of the ordinary bismuth compounds. It is said to cause the disappearance of the treponema from the tissues and the healing of specific lesions as rapidly as the best of the antisyphilitic remedies, and no relapses are recorded. The blood-tests are stated to be negative after a single series of twelve injections. In experimental trypanosomiasis of the mouse and rabbit, and in fowl spirillosis the compound is said to have a trypanicide and spirillicide effect *in vivo*.

Bismuth acetylamino-oxyphenylarsenite is manufactured and put on the market under the trade name "Bistovol" by May and Baker, Ltd. It is supplied in ampoules, each ampoule containing three cubic centimetres of a ten per cent suspension of the drug in oil. The dose for adults is two and a half to three cubic centimetres administered by deep intramuscular injection at intervals of four to five days.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Any demand for *reprints, additional to the above*, or for excerpts must be forwarded at the time of submission of the article for publication.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are inserted free of charge to subscribers. All these communications should be written upon one side of the paper only; they should by preference be typewritten; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS." War Office, Whitehall, S.W.1.

The Committee has sanctioned the publication of correspondence on matters of interest to the Corps, and of articles of a non-scientific character under a nom-de-plume. These communications must, however, be approved by the Editor before publication.

Cheques or Postal Orders for Subscriptions, etc., should be made payable to the "Hon. Manager, Journal R.A.M.C." and crossed "Holt & Co."

All communications should be addressed to THE HON. MANAGER, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," WAR OFFICE, WHITEHALL, S.W. 1.

Remineralization

of the System, following infection or shock, is one of the fundamental axioms of therapeutics.

Compound Syrup of Hypophosphites
"FELLOWS"

contains chemical foods in the form of mineral salts and dynamic synergists in an assimilable and palatable compound, and has established its reputation as the *Standard Tonic* for over half a century.

Samples and literature on request

Fellows Medical Manufacturing Co., Inc.
26 Christopher Street **New York City, U. S. A.**

VALENTINE'S MEAT - JUICE

In the **Treatment** of **Weak Babies**, in the **Gastric** and **Enteric Troubles** of **Infants** and in the **Wasting** and **Febrile Diseases** of **Children**, the **Ease** of **Assimilation** and **Power** of **Valentine's Meat-Juice** to **Sustain** and **Strengthen** has been **Demonstrated** in

Hospitals for Children.

The quickness and power with which Valentine's Meat-Juice acts, the manner in which it adapts itself to and quiets the irritable stomach, its agreeable taste, ease of administration and entire assimilation recommend it to physician and patient.

For sale by European and American Chemists and Druggists.

VALENTINE'S MEAT-JUICE CO.,
Richmond, Virginia, U. S. A.

CB 95

No. 5. May, 1926. Vol. XLVI.

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

LIEUTENANT-COLONEL A. E. HAMERTON, C.M.G., D.S.O., R.A.M.C.

ISSUED MONTHLY

Printed and Published by

JOHN BALE, SONS & DANIELSSON, LTD.

83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

Price Two Shillings net.

BY APPOINTMENT

Regimental Badge Jewellery.

9-ct. Gold and Enamel Brooch with Gold Snake £4 7 6

18-ct. Gold and Enamel Brooch with Rose Diamond Snake ... £7 10 0

THE Badge illustrated is one of the many fine pieces of Jewellery produced by the Military Department of the Goldsmiths and Silversmiths Company. Whilst taking pride in the beautiful specimens fashioned by their expert craftsmen, the Company does not lose sight of the fact that plain and simple badges of Gold and Enamel are often preferred. Of these many pieces exist, bearing the same care and attention to detail and workmanship as is bestowed on all the Company's productions.

Selections sent for approval to any part of the United Kingdom.

The Goldsmiths & Silversmiths Company Ltd.

No Branches. Only ONE Address.

112, Regent Street, London, W.1.

***For* INDIGESTION *and* DYSPEPSIA**

Lactopeptine

LACTOPEPTINE IS A NON-SECRET REMEDY WITH ITS FORMULA ON THE LABEL OF EACH BOTTLE

ELIXIR LACTOPEPTINE

A very palatable form of administering Lactopeptine combining the digestive properties of the latter with the stimulating effect of a pleasant aromatic tonic. Specially recommended.

THE digestive ferments (pepsin, pancreatine, diastase) used in the manufacture of Lactopeptine are of the highest grade. Although this preparation has been prescribed by the Medical Profession for over 40 years, its ingredients have been constantly improved and kept up to date by the most advanced pharmaceutical practice.

When prescribing specify in all cases Lactopeptine (Richards). Dispenred in 1 oz. (4/6) and ½ oz. (2/9) bottles, in powder or tablet form. To prevent substitution, Medical men are requested to prescribe Lactopeptine in original bottles.

Samples (powder, tablet and Elixir form) free of charge on receipt of professional card.

JOHN MORGAN RICHARDS & SONS, LTD.,
46 HOLBORN VIADUCT, LONDON, E.C.1.

Vol. XLVI. May, 1926. No. 5.

Journal
of the
Royal Army Medical Corps.

Original Communications.

SOME NOTES ON OLD-TIME LEPROSY: THE CASE OF KING ROBERT THE BRUCE.[1]

By Brevet Lieutenant-Colonel W. P. Mac ARTHUR.
Royal Army Medical Corps.

Two reasons prompted the choice of my subject this evening. The invitation to address this learned Society—an honour I deeply appreciate—arose out of a recently published paper on Old-time Leprosy in these islands,[2] therefore some development of this theme seemed appropriate; and the particular point for discussion was determined when several persons, interested in the said paper, expressed regret that Bruce's alleged leprosy had received no notice there. Consequently I propose to consider the evidence on which, from the fourteenth century until to-day, this great monarch has been adjudged a leper.

For several years before his death Bruce is known to have been in failing health, attributed to continued exposure, fatigue and privation endured when a hunted fugitive, and which certainly were severe enough to undermine the health of any man. Even as early as the winter of 1307 he lay grievously sick from some malady ascribed at the time to the hardships he had undergone. However this may be, so far as I know there is no imputation of leprosy by any Scottish historical writer of the fourteenth century.

When an old chronicler treats of events of his own times, naturally he deserves a respectful hearing, and if his account is found to be confirmed by State papers, or by some independent contemporary writer, the historical

[1] An address delivered to the Section of the History of Medicine, Royal Society of Medicine, and printed by permission.

[2] *Journal of the Royal Army Medical Corps*, xlv, 6.

value of his record is enhanced accordingly. But it is well to remember that in Bruce's day—and indeed for three hundred years afterwards—State archives were impenetrably guarded, and were inaccessible for consultation by historians. Consequently the materials for reconstructing past history were lacking, even if the method had been understood, and an honest chronicler writing of times gone by was reduced to copying what someone else had left on record, and so cannot be reckoned an independent authority on events lying beyond his own ken.

There were three original writers who had ample opportunity for collecting accurate information regarding Robert Bruce from his comrades and others who had lived and served with him, and who rank as historical authorities for this period. They are: John of Fordun; John Barbour; and Andrew of Wyntoun.

John of Fordun, author of the *Scotichronicon*, makes no mention of any disease, and so may be dismissed at once.

John Barbour composed that immortal and heart-stirring epic, *The Brus*, where he preserves so many details of King Robert's wars and adventures which otherwise would be unknown. In the earlier portion of the poem Barbour takes deliberate advantage of poetic license, but from the beginning of the War of Independence, and onwards, the work becomes a valuable record, and, in Bain's words, "in all essential points stands the test of historical criticism." [1], [2] Barbour does not mention leprosy. He says the fatal illness began as a "founder" caused by the King's "cold lying" in his time of trouble.[3] Which may, or may not, be true; oracular status, it appears, is reserved for mediæval historians who wrote in Latin.

In his rhymed *Orygynale Cronykil*, Andrew of Wyntoun merely relates that the King "lay in lang seckness," and that "hys lattyr day he closyd in gratyous state ".

If King Robert had suffered from leprosy, or from any ill which then would have been regarded as leprosy, the fact would have been common knowledge throughout Scotland—where Bruce had many enemies—and it is difficult to see what Barbour and Wyntoun could gain by suppressing

---

[1] Bain, J., *Calendar of Documents relating to Scotland preserved in H.M. Public Record Office*, III, Introduction.

[2] Maxwell points out an interesting example of Barbour's singular accuracy. Barbour says that John of Lorn led "800 men and more" to aid the English Viceroy, De Valence. De Valence's warrant, discovered in the State records, authorizes payment to John of Lorn for 822 men. *Robert the Bruce*, 152.

[3] "For ane male efs tuk hym so sare,
That he on na vifs mycht be thar. [i.e., the Prince's wedding.]
His mail eifs of ane fundying
Begouth; for, throu his cald lying,
Quhen in his gret myschef wes he,
Him fell that herd perplexite." [i.e., his mortal sickness].
The Brus. Skeat's ed., Bk. XX, 74.

the name of his malady. There seems to have been no deliberate avoidance of the subject from reasons of national pride, for the story is freely repeated by later Scottish writers in their adaptations of earlier records, native or foreign.

Bruce's leprosy is found recorded in two connexions only. First, to explain his action in appointing Moray and Douglas to command the Weardale expedition (1327) in his stead; and, second, as the cause of the monarch's death, some two years later.

The earliest mention of the disease, which I have been able to trace, occurs in the *Chronicon de Lanercost*. This general history of England and Scotland, from 1201-1346, is attributed to an unknown Franciscan monk of Carlisle. In spite of some natural bias against the Scots, the chronicle is a valued contemporary authority and throws much light on the War of Independence, more especially as in some instances the author was an eye-witness of the events he describes.

According to the *Chronicon*, Bruce deputed the command of the army during the Weardale campaign "because he had become leprous" (*Dominus autem Robertus de Brus, quia factus fuerat leprosus, illa vice cum eis Angliam non intravit*)[1]; and the assertion of leprosy is repeated in the notice of the king's death (*Mortuus est dominus Robertus de Brus, rex Scotiae, leprosus*)[2]. One may point out in passing that the clerk of Lanercost would have written "*rex Scotorum*," and not "*rex Scotiae*," if he had possessed any knowledge of Scottish state affairs.

The delightful old French chronicler Froissart—who travelled for six months in Scotland some thirty-odd years after Bruce's death—follows the account given above. He explains that King Robert, "who had been most valiant," nominated Moray and Douglas to command the Scottish army in this campaign, because he "was then very old and stricken with leprosy" (*qui étoit moult preux étoit adonc moult vieux et chargé de la grosse maladie*[3]). He too attributes Bruce's death to this disease[4], incidentally misdating the king's decease by a year.

There is no chronicle which tells us anything more than the two just quoted, and most relate less. As already mentioned, the Scottish authors authoritative for the period are silent. I have encountered only one other contemporary original record of Bruce's leprosy; this occurs in the *Chronicon* of Walter de Hemingburgh, a cleric of Gisborough, Yorkshire. Like the clerk of Lanercost, he too lived in an enemy country where

---

[1] *Chronicon de Lanercost*; Maitland Club; 259.

[2] *Ibid.*, 264.

[3] *Chroniques de Froissart*; Buchon; I, 79. "*La grosse maladie*" does not appear to have been a current French phrase. Presumably it is intended to translate "*Elephantia*," a term for leprosy and mange. See "Old-time Leprosy," *loc. cit.*, 416, footnote.

[4] Froissart, *ibid.*, 113.

accurate information regarding this devil incarnate—as these good monks regarded Bruce—was not easily come by. The grotesque stories recorded of the German Emperor during the late war will not be cited as evidence by serious writers of the future; at least we trust not.

I do not propose to quote from the later chroniclers, for a multiplicity of such accounts adds nothing to the weight of evidence. These scribes had no personal knowledge of the matter, and were content, with the pathetic faith of their kind, to copy without question whatever their predecessors had written down.[1]

It seems advisable to give a short descriptive note on the Weardale campaign before going on to explain the true reason for Bruce's absence.

Some days before June 15, 1327, the Scottish forces under the Earl of Moray and Sir James of Douglas crossed the Border. They harried and wasted in Northumberland and Westmoreland, and finally established contact with the main English army in Weardale, Durham. Here it was that Douglas carried out a famous exploit, one night in August. At the head of 200 picked horsemen, one half carrying swords, and the remainder spears, he approached the enemy lines. He went on alone, passing the outposts by impersonating an English officer, and then, followed by the cavalry, charged the camp at a gallop. The swordsmen cut the tent ropes as they passed, and the spearmen stabbed through the fallen tents. Douglas rode straight for King Edward's pavilion, and almost succeeded in capturing the king, but in the darkness and uproar Edward made good his escape, and the Scots withdrew to their lines with small loss. Later in the month the Scottish armies returned across the Border, in John of Fordun's words, safe and sound.

Bruce was absent from the Weardale expedition not through leprosy, or any other disease, but because he had gone to Ireland in an attempt to

---

[1] In this connexion we find Walsingham's *Historia Anglicana* and the *Ypodigma Neustriae* (early 15th century texts) cited as independent witnesses in support of Hemingburgh. But throughout the period that interests us the *Historia* is copied from Hemingburgh, paragraph by paragraph, usually without alteration of a single word. The *Ypodigma*, too, borrows from Hemingburgh, though in a less whole-hearted fashion. But, apart from this, the *Ypodigma* is discredited as an independent witness, because Walsingham wrote both the *Historia Anglicana* and the *Ypodigma*. But this is not the most extreme development of the literalist conception of proof, for the imaginative Hector Boece (born about 1465), is quoted as confirmatory evidence, although his historical fabrications excited derision even in his own credulous age. Leland, a contemporary, writes of him :—

> "*Hectoris historici tot quot mendacia scripsit,*
> *Si vis ut numerem, lector amice, tibi,*
> *Me jubeas etiam fluctus numerare marinos,*
> *Et liquidi stellas connumerare poli.*"

And to this goodly fellowship of witnesses is added William Stewart, whose *Buik of the Chroniklis of Scotland* is merely a translation of the egregious Hector Boece.

create a diversion there. Two documents discovered by Bain amongst the State papers in the Public Record Office put this beyond question. The first is an Indenture between Robert, King of Scotland,[1] and Henry de Maundeville, Seneschal of Ulster, whereby the King grants a truce to the Ulstermen for a year in return for 100 cendres of wheat and 100 cendres of barley, Scottish measure, to be delivered free in the haven of Ulringfrith,[2] one half at Martinmas, and the other at Whitsunday following. The Irish of Ulster who adhere to the said King being included in the truce. The seals of the said King and the said Henry appended. This is dated at Glendouyn [Glendun, co. Antrim], July 12, 1327.[3]

Clearly Bruce's enterprise came to naught, or more would be known of it, and for the same reason there can have been little or no fighting.

The second of these documents confirms the first, and shows further that some bargain unfulfilled by the Ulstermen caused the failure. This paper is a petition to Edward III by John le fitz William Jordan of Ireland, showing how he was promised £100 of land in Ireland for his good service to the King in 1327, when Sir Robert de Bruys was balked of his design on arriving in Ireland, by breach of agreement (*par faux covine*), as shown in a return before the King in 1332 when £50 was granted him for life. The petition is endorsed: "Let him have letters patent for £50 for life and the £13 in Ireland to their best judgment."[4] However Bruce's scheme may have been frustrated, the English authorities clearly rated the petitioner's services very highly when they awarded him this large pension, translated into present-day values.

So much for the "leprosy" which detained Bruce in Scotland.

The assertion of leprosy in connexion with the monarch's death is not as easily disposed of as the Weardale fable, but I believe it is no better founded. King Robert returned home after his fruitless Irish mission, and later in the same year the Scots crossed the Border again in three armies. One of these, led by Bruce himself, carried fire and sword far into Northumberland and Durham until the terror-stricken inhabitants offered an indemnity if the Scots would only refrain from harrying their districts for one year. Truly a notable military ascendancy for a force captained by a leper within some eighteen months of his death!

The events of Bruce's declining years, and the circumstances of his last illness and moving end, lend no support to the belief that he was afflicted either with leprosy or with any of the dozen ailments, more or less, which

---

[1] The "King of Scotland" shows that the Indenture was engrossed by some clerk not of Bruce's party.

[2] Larne, co. Antrim.

[3] Bain, *op. cit.*, III, 167, and introduction.

[4] *Idem*, *op. cit.*, III. 217.

then were confused with that disease.[1] King Robert's health was broken, but he still continued to direct affairs of state. At last peace had been made with England, and in confirmation thereof a marriage took place between the Scottish heir, aged four, and Princess Joan, aged six, sister of Edward III. Bruce was too ill to undertake the trying journey to Berwick, where the marriage was solemnized on July 12, 1328, but the quaint bridal pair visited him at Cardross after the ceremony. Later in the year King Robert was well enough to journey to Edinburgh, where he attended Parliament, and in great state crowned, with his own hands, says Barbour,[2] his son and Princess Joan. Such an act on the part of a leper—spreading infection, as was believed, by his breath and touch—would have been an infamous outrage in the 14th century.

Although the King made Cardross his headquarters he did not live in retirement there, but travelled about his country as necessity required. He visited Galloway within nine weeks of his death, staying at Glenluce on March 29.[3] Returning to Cardross Castle Bruce transacted public business there as late as May 11. When the end was near, "all the lords of the country" were summoned to Cardross, and there, surrounded by his nobles, Robert de Brus, King of Scots, passed peacefully away, on June 7, 1329, one month before his fifty-fifth birthday.

The death-bed scene, the charge to bear the royal heart to the Holy-land—" Since therefore that my body cannot go to achieve what my heart desires, I will send my heart in the stead of my body to accomplish my vow "[4]—and Douglas's valiant attempt to fulfil the dying request, have become a fireside story. There is no hint here of the abhorred death-

---

[1] There is a very significant paragraph in an Act of the Scottish Parliament, dated June 10, 1344, where King David (son of Robert the Bruce) speaks of the infant-body (*offa*) of John, his true brother (*frater noster germanus*), as having been buried in Rostenot (Restennet). David was five years old when his father died, and if the words in the Act mean what they say, there was a still younger child, born therefore at a time when Bruce's supposed infection would have been far advanced. This is some evidence, of a medical nature, against the theory that Bruce suffered from true leprosy. It is strong evidence that in his own day he was not even believed to be leprous. Leprosy was not a valid cause for divorce in Scotland, but in those times the disease was held to be, amongst other modes of transmission, a *lues venerea*.

I know of no other record of this John, but the omission of any reference in the chronicles is quite intelligible. The child was not the heir, and his existence, very brief from the wording of the Act, would not merit an entry.

Maxwell, *op. cit.*, 354, writing in quite another connexion, accepts the fact of this child's birth without question. He says: " Subsequently a younger son, John, was born, but he died in infancy, and was buried in Restennet."

The curious will find the above-mentioned reference in *Acts of the Parliament of Scotland*, I, 514.

[2] *The Brus*, Bk. xx.

[3] Maxwell; *op. cit.*, 338.

[4] Froissart.

chamber of one smitten with what the age called, that abominable blemish, the foul contagion of leprosy.

An inquiry into the long feud between Bruce and the Vatican discloses evidence which to my mind disproves the leprosy legend.

The awful sentence of the major excommunication was first pronounced on Robert Bruce as early as 1306, on account of his rebellion and for his sacrilegious stabbing of Red John Comyn—a rival claimant to the crown—in the church of the Grey Friars, Dumfries. To the idea of the fourteenth century, the sacrilege was infinitely the most reprehensible part of this fatal encounter.

On the grounds that he treated this sentence with contempt, and "damnably persevered in iniquity," the following year a bull issued by Pope Clement V was promulgated "with candles lighted, and bells rung" excommunicating "most fearfully, Robert de Brus, with his adherents, as a man perjured and a wicked disturber of the common peace."[1]

This was grave enough in all conscience, but there was infinitely worse to come. Edward II, having been heavily defeated and desiring peace, in 1317 besought the assistance of the then Pope, John XXII, to bring the Scots to reason. But in his laudable desire to prevent further bloodshed the Pope attempted the impossible. The English would not suffer the humiliation of according royal dignity to "the rebel, Robert de Brus, late Earl of Carrick," and the Scots would not make peace until his sovereignty was acknowledged. The Pope tried to bridge this impassable gulf by addressing himself to "Robert de Brus, governing in Scotland." But Bruce would not compromise. He was King of Scots, or nothing; and refused to publish the papal bull decreeing a truce, brought to England by the Cardinals Luke and Guacelin armed with absolute powers of excommunication against all who might deserve it. Representatives of the Papal Legates waited on Bruce in the hope of winning him over from his obduracy—a triumph of hope over experience not justified in the event. Bruce received them graciously but refused to open the sealed letters from the Pope, pointing out, with assumed ingenuousness, that they were not addressed to "The King of Scots," and so it would ill become him to open letters possibly intended for some other Robert de Brus, a name common in Scotland. After further fruitless discussion, the papal deputies returned to England.

The Cardinals then unwisely decided to have the bull proclaimed in Scotland without Bruce's authority, and dispatched a cleric named Andrew Newton on this hazardous enterprise. Newton attempted to obtain an audience with Bruce, then near the Border. This was denied him. Becoming alarmed, he then asked for a safe-conduct back to Berwick. This, too, Bruce refused, and ordered the papal agent to leave Scotland

[1] Walter de Hemingburgh; *Chronicon*, Hamilton, II, 253.

forthwith. On the road to Berwick, Newton was attacked, stripped of his clothing, and the Pope's missives torn in pieces.

The consequences of this outrage are set out in the following passage translated from the *Chronicon de Lanercost*: "The Cardinals . . . wrote to all the prelates of England that in every mass, both on ordinary days and holy days, they should thrice denounce Robert de Bruse with all his counsellors and adherents as excommunicate; and on the Pope's behalf they proclaimed him detestable and bereft of all honour, and placed all his lands and the lands of all his adherents under ecclesiastical interdict, and decreed the children of all his adherents to the second generation incapable of holding any ecclesiastical office or benefice. Also against all prelates of Scotland, and all clerics, whether exempt or non-exempt, adhering to the said Robert or showing him favour, they promulgated sentence of excommunication and interdict. Howbeit the Scots, stubborn in pertinacity, cared for no excommunication, neither would they give any heed to the interdict."[1]

The dread sentences decreed by the Papal Legates were confirmed by the Pope himself; "nevertheless," says the clerk of Lanercost despairingly, "Robert de Bruse, caring nothing for this, continued in his contumacity, just as before."

In 1320 the Pope summoned Bruce to appear before his court at Avignon. He refused. Another mandate was launched against him, and this time the sentence of excommunication included the direction that in no circumstances was the ban to be lifted until Robert de Brus should be at the point of death.

The wax candles were lighted and extinguished, as ritual demanded, and the dread penalties recited in due form, but the outward and visible results amounted to exactly nothing. I assume that the ecclesiastics proclaiming these awful sentences dealt only with matters spiritual, and had no thought of the affairs of this world. But certainly that was not the view of the English laity, nor of the lesser sort of clerics, who confidently watched for some material sign of the divine displeasure.[2] But the louder the denunciations, and the fiercer the execrations, the more did Bruce's temporal fortunes advance, and his cause flourish. And the English, who shed rivers of blood for twenty-two years rather than grant him the simple style of "King of Scots," were forced to withdraw all pretention to the suzerainty of Scotland in a letter addressed by Edward III to, "The Magnificent Prince, Lord Robert de Broys, by the grace of God, Illustrious

---

[1] *Op. cit.*, p. 238.

[2] In this connexion the Lanercost Chronicle has the reflection—obviously recorded between the advent of Edward Balliol and his overthrow—"Therefore it is not to be wondered at, that afterwards the heavy vengeance of God, in the appearance of a true heir of the realm, visited so rebellious a people whose head (I will not call him king but usurper) showed such contempt for the Keys of Holy Mother Church."

King of Scots, our Ally and our most cherished Friend"![1] What a triumph to have pointed at this sacrilegious murderer, this contumacious rebel against Christ's Vice-gerent on earth, smitten with leprosy by the hand of God! It seems incredible that such a chance would not have been seized, and this judgment on Bruce proclaimed to all Europe.

King Robert's enemies—English and Scots—called him by every ill-name they could lay a tongue to—de Brus the Murderer, de Brus the Usurper, de Brus the Scottish Felon.[2] And when they had exhausted their store of vituperation against the King, they turned on the infant prince—only five years old when his father died—and vilified the child in language so infamous and foul that even in the Latin one dare not repeat it. But in all this spate of calumny there is no word of de Brus the Leper. That alone would have been worth all the other epithets added together and multiplied to seventy times seven.[3]

Robert the Bruce's alleged leprosy is recorded in modern writings, first, as a point of pure historical interest; and second, in medical texts to illustrate the contemporary prevalence of that disease, then, and now, grossly exaggerated. The evidence for this contention is of the merest literalist nature, based solely on the employment of the word *leprosus*, and its equivalents, by lay writers in a hostile or foreign country. Even if it could be shown that those in contact with Bruce deemed him a leper—and there is no ascertainable evidence of any such belief—this alone would prove nothing, for psoriasis, pityriasis, tubercular lesions of the skin, and so forth, were then regarded as leprosy.

It seems likely that this story—repeated without challenge for six hundred years—originated in some attempt to explain Bruce's strange absence from the field of Weardale. The King of Scots was known to be ailing, yet in no peril of death. There may even have been some rumour of his mysterious disappearance from the Scottish Court. Leprosy—always a mediæval obsession—and a consequent retirement, would explain everything. The English authorities were well aware of Bruce's mission to Ireland, but this information, as we know, never reached these retired chroniclers. And the mortal leprosy legend when once written down in a

---

1 *Liber Pluscardensis*: Hist. Scot. series, VII, 258.

2 An English state paper, dated as late as December 18, 1328,—after the peace, and subsequent to the "Magnificent Prince" letter given above—confirms Hugh de Templiton, of Ireland, in possession of the estates forfeited by William de Say for his rebellion "in company of Robert de Bruys, Edward de Bruys and other Scottish felons in Ireland." Bain, *op. cit.*, III, 173.

3 At this period feeling against lepers was running high, and nothing more is heard of "Christ's poor." It was solemnly asserted and believed that lepers on the Continent had leagued themselves with the Saracens, and were actively engaged in poisoning the Christians' wells. As a result of this grotesque libel some of these afflicted wretches were actually burned alive. See, *inter alia*, the *Chronicon de Lanercost*.

book put on immortality, and no power on earth could ever extirpate it—not though backed by candles lighted and bells rung. And so our modern text-books, in the direct line of this apostolic succession, make the bold assertion, "Robert Bruce died of leprosy in 1329."

The nameless clerk of Lanercost notes the death of King Robert the Bruce in these words: *Mortuus est dominus Robertus de Brus, rex Scotiae, leprosus.* A mean epitaph, wrong in setting out the deceased monarch's style, and mistaken, as I believe, in the disease recorded. We can see him penning "*leprosus*" with a malignant smirk, well content at the foul death of one who had been *Anglorum Malleus.*

Contrast the brave ring of John of Fordun; exact in the minor point of style he assigns no cause of death in the manner of Latin chroniclers who had nothing strange or untoward to relate: *Obiit piae memoriae Robertus de Bruyse, rex Scotorum illustris, ultra omnes viventes suis diebus miles strenuus*[1]—"Robert de Brus, of pious memory, illustrious King of Scots, beyond all men living in his time a valiant knight."

[1] *Scotichronicon*, Hist. Scot., series I, cxliii.

DENTAL SEPSIS, ITS NATURE AND SYSTEMIC EFFECTS.

By Captain S. H. WOODS.

The Army Dental Corps.

(*Continued from p.* 268.)

Group (2).—Cases Illustrating Alimentary Absorption.

The alimentary path is the most obvious and has in consequence attracted the greatest attention. Until recently, the attention of the physician was focused principally on obvious dental sepsis such as pyorrhœa with free flow of pus and offensive odour, and when this was present in his patients he recognized the importance of its elimination.

Before describing the cases, let us first consider briefly normal and abnormal infection of the gastro-intestinal tract.

(*a*) *Normal Infection of the Gastro-intestinal Tract.*

We have seen that normal saliva teems with organisms, and these are swallowed constantly during the twenty-four hours, except in sleep, when salivation ceases. Adventitious organisms are taken in, generally in enormous numbers, with food. Yet no constitutional symptoms arise, and Adami has called this condition "normal infection," which we may summarize as follows:—[1]

(1) Bacteria are mostly killed or inhibited by gastric juice.

(2) The duodenum is usually sterile a few hours after a meal.

(3) Bacterial growth starts afresh in the small intestine.

(4) Increases in intensity till the colon is reached.

(5) The selective activity of bile checks growth of more delicate streptococci, but has no action on hardier strains.

(6) The majority of intestinal bacteria are expelled with fæces.

(7) The remainder pass through the intestinal wall, where they are either:—

(*a*) Arrested in subcutaneous lymph nodules.

(*b*) Trapped in mesenteric and retro-peritoneal lymph glands.

(*c*) Reach the venous radicles of the portal vein, where the endothelial cells arrest the leucocytes with the contained bacteria.

As regards the bacterial toxins, they are adequately dealt with by the alchemy of the liver.

(*b*) *Abnormal Infection of the Gastro-intestinal Tract.*

"Any septic condition of the mouth adds fresh organisms, the normal flora being increased and new varieties appearing. The abnormal flora in

[1] Condensed from J. F. Colyer, "Dental Surgery and Pathology," pp. 681-683.

conjunction with abnormal environment modify the virulence of the organisms in the direction either of attenuation or of exaltation."[1]

In all suppurative conditions of the mouth (open dental sepsis) the pus and bacteria swallowed cause a gastritis, which weakens the gastric defence, and vast numbers of germs pass into the small intestine. The intestinal defences are taxed to their utmost and increased numbers of germs pass into the system.

Adami[2] considers this condition leads to a "sub-infection" rather than an active infection. "The bacteria carried in do not multiply and set up foci of suppuration. They are destroyed, but with their destruction the liberation of their toxins causes a poisoning of the cells immediately around them and the accumulative action of these toxins, whether locally or at a distance—upon the liver cells, for example—brings about the death of certain cells and replacement by fibrous tissue."

The toxins are not neutralized by the overtaxed normal defences and enter the circulation.

It is outside the scope of this paper to discuss intestinal toxæmia, but the work of Mutch[3] in this connexion must be mentioned. He has shown that when there is streptococcal infection of the mouth, as in pyorrhœa, the predominating organisms in the upper part of the alimentary tract are streptococci of the long-chained variety. In the lower zones the *B. coli* is predominant, while in the intervening portion there is a varying combination of the two. The seat of maximum infection in the bowel is in the lowest coils of the ileum, where a large area of the mucous membrane is involved, and hence dissemination of infection by the lymph channels and blood-vessels to all parts of the body is rendered easy.

Mutch has shown that this bacterial distribution is profoundly modified by alterations in diet assimilation and in mobility of bowel, causing a difference in the relative dominance of the bacterial strains. A glycophilic streptococcus is frequently present in such conditions as chronic muscular fibrositis, arthritis deformans, chronic Bright's disease, various forms of anæmia, chronic infective endocarditis and chronic colitis. It takes on rapid growth in the presence of sugar, and generates acid to such a degree as to kill off all other infective organisms. Bowel stagnation, more especially in chronic ileal stasis, enables the organisms to collect, to act on carbohydrate material, to grow and generate acid and inhibit the growth of *B. coli* and its allies.

A chronic infection is thus set up, first in the chyme, then in the intestinal mucous membrane, from which later there is a systemic invasion. Now infected gums are a source of such glycophilic organisms in great

[1] Colyer, J. F., *ibid.*

[2] Adami, J. G., "Chronic Intestinal Stasis," *British Medical Journal*, January 24, 1914.

[3] Mutch, N., "Alimentary Infections in Chronic Arthritis," *Lancet*, December, 1921.

numbers, and in well-established pyorrhœa there is not only the organism but in practically every case, also the necessary bowel stagnation for its development which is produced by the lowered muscular tone in the bowel wall resulting from its chronic infection.

In 200 cases of arthritis, Mutch found pathogenic streptococci in the colon in 168, and in 104 of these cases he concluded that the primary focus was a dental infection.

This explanation in some detail is necessary because, unlike latent sepsis which produces well-marked localized systemic lesions of some severity, open sepsis produces widespread but not obvious lesions which can only be understood in the light of this explanation.

These widespread and somewhat indefinite effects are divisible into three main groups:—

(*a*) General debility.
(*b*) Neurasthenia.
(*c*) Anæmia.

They may occur singly or in various combinations, and may be regarded as a "pyorrhœa complex."

Case 15.—Colonel J., aged 48.

Attended for dental treatment because of "bad breath and bleeding gums."

General Condition.—Typical picture of general debility and neurasthenia. Had been a good athlete for many years but recently noticed exercise tolerance was much reduced. His work became uninteresting; his temper sharp; and sports were gradually reduced and then given up.

Dental Condition.—Twenty-four teeth standing, all involved in very extensive pyorrhœa. Much pus; all teeth loose; breath foul; little alveolus left and general osteoporosis of both jaws.

Treatment.—Complete clearance; few at a time as patient gave marked reactions to early extractions, and though these were painless his neurasthenia was such that he was practically prostrated after each visit.

Result.—Total change in outlook on life even before dentures were inserted.

End Result.—May best be expressed by stating this patient, seven months later, won an open Army Athletic Championship in which great exertion was necessary.

Note.—(*a*) With the twenty-four teeth involved, the pus secreting area was approximately twelve square inches.

(*b*) The mandible and maxilla were infected to a considerable depth, and I estimated the volume of bone infected to be roughly four times that of the roots.

(*c*) Patient reported he noticed bleeding of gums nine years ago.

Case 16.—Colonel F., aged 56. Admitted April 24, 1924.

Condition.—Chronic bronchitis, emphysema and some debility.

Dental Condition.—Twenty-five teeth present, all involved in pyorrhœa but not so extensive as in previos case.

Treatment.—Complete clearance under ether, after two had been removed under local anæsthetic for preparation of vaccine, which was prepared from not-identified non-hæmolytic streptococci. Left hospital May 3, 1924, and attended for vaccine administration.

End Result is taken from Case Sheet, which states on October 10, 1924, "Practically well and fitter than ever."

It is not necessary to report more cases of this nature, of which a large number have been treated. The number of teeth varies, as does the extent of infected tissues, but in each case the result is an expression of the pyorrhœa complex.

Frequently, latent and open sepsis are present in the same mouth, the resulting constitutional symptoms being complicated.

Case 17.—Major S., aged 47. Admitted June 11, 1924.

Condition.—(*a*) Osteo-arthritis of third and fourth cervical vertebræ; (*b*) neuritis right shoulder and arm with considerable weakening; (*c*) marked neurasthenia. No definite nervous changes.

Dental Condition.—Twenty-five teeth present, of which two were crowned and two root-filled. These four showed on X-ray obvious latent sepsis. Remainder involved in pyorrhœa of moderate degree.

Treatment.—Total clearance, marked reactions following early extractions.

Result.—(*a*) Gradual improvement in neuritis, which was maintained, and increased muscular tone.

(*b*) Decrease and cessation of pain in neck.

(*c*) No increase in limitation of neck movements.

(*d*) Neurasthenic symptoms lessened, slowly at first and then more rapidly.

After six months leave, reported to be fit except for limitation of certain neck movements and of muscular tone of right arm. Patient subsequently retired and wrote from Kenya that "he felt better than at any time during last five years."

Case 18.—Colonel R., aged 43. Admitted December 3, 1923.

Invalided from India as N.Y.D.

Condition.—Asthenia and toxæmia of unknown origin and anæmia. Height, five feet ten inches; weight, eight stone two pounds; emaciated.

Pulse, soft and slow; heart sounds weak; bowels irregular; lungs. spleen and liver normal.

Has had malaria; has gone steadily down-hill during last tour in India and now feels weak, unfit for any exertion and dull mentally. No amœbæ in stools; urine normal.

No tropical disease discovered. Bismuth meal showed no abnormality.

Dental Condition.—Teeth standing: $\begin{array}{r|l} 8\ 6\ 4321 & 123\ 5678 \\ \hline 87\ 5\ 321 & 123456\ 8 \end{array}$

$\underline{|8}$ was crowned and loose and odontograms showed osteo-porosis of whole tuberosity of maxilla.

$\frac{861 | 16}{\quad | 8}$ were septic under root fillings.

Remainder of upper teeth and $\overline{21 | 12}$ were involved in moderate pyorrhœa of long standing.

Treatment.—Removal of all affected teeth, $\underline{|8}$ being sent for preparation of vaccine. Report gave *S. subacidus* (hæmolytic), *S. salivarius* and *S. ignavus*. Full course of vaccine.

Result.—On return from six months leave :—

Weight, nine stone six pounds; no anæmia; heart and pulse good. Bowels still irregular, and vague abdominal symptoms.

Condition stationary for next six months; abdominal pain suggested chronic appendix, which was removed on February 17, 1925, when stomach, duodenum and gall-bladder were found normal.

Three months leave, at end of which weight was ten stone two pounds; no recurrence of abdominal symptoms and passed fit for duty.

Note.—(*a*) Presence of hæmolytic streptococcus.

(*b*) Conserved teeth filled for many years.

Group 3.—Systemic Effects Resulting from Direct Extension.

This heading embraces the following :—

(*a*) Affections of maxillary antrum.
(*b*) Affections of eye.
(*c*) Affections of ear.
(*d*) Affections of throat.
(*e*) Affections of nose and sinuses.
(*f*) Neuralgias.

The main factor by which they are differentiated is the anatomical relation of periosteum, mucous membrane, bones, blood-vessels, lymphatics and nerves.

(*a*) *Affections of the Antrum.*

The thickness of bone separating the floor of the orbit and the apices of molars and bicuspids varies from a maximum of $\frac{3}{8}$ inch to a minimum of $\frac{1}{16}$ inch.

It used to be held that dental conditions of these teeth only affected the antrum when they were acute, and it was supposed that the pus from the abscess bored its way through the bone and reached the mucous membrane lining the antrum.

Recent investigation and experience tend to show a very definite connexion between the latent sepsis of these teeth and those chronic and intractable affections of the antrum which are so frequently seen. The careful study of odontograms of periapical infections of bicuspids and molars indicates a subacute infection of the bone above them often involving a zone, external to the obviously infected region, the periphery of which often reaches the compact bone lining the antrum.

Adami considers that pathogenic organisms from the initial focus can

penetrate such a zone, and if his view is correct, it will explain those somewhat surprising cases in which the removal of a tooth will profoundly affect a chronic antral condition. The molar or bicuspid need not necessarily show any definite radiographic evidence of periapical bone infection. Frequently these teeth have no caries or fillings and the pulps appear alive, but there is some cause of external infection of gingival trough or periodontal membrane, such as impaction of food, subgingival tartar or excessive biting strain, producing a mild persistent periodontitis, which is sufficient to cause the necessary conditions for the passage of organisms into the substance of the bone. The pathology of such external infections of gingival trough and periodontal membrane has been considered, and every caution is necessary, both in clinical and radiological examination in all antrum cases, and the possible relationship of teeth and chronic antrum must be viewed from this standpoint.

Many cases of acute antritis for which teeth are considered directly responsible have been treated during the last three years, but these are outside the scope of this paper, which deals with chronic conditions only. Of these, five cases occurred in which the removal of teeth free of caries or fillings led to complete cure after months of routine treatment, the cures in three cases being surprisingly rapid.

As regards pyorrhœa, the same standpoint must be assumed. The connexion of tooth and antrum is obvious when the bone recession is marked, but we have seen that a slow gum recession often masks a very extensive destruction of bone, and in all cases a radiogram is necessary to define the limit of sound and unsound maxillary bone.

(*b*) *Affections of the Eye.*

The floor of the orbit is the roof of the antrum and is a part of the maxillary bone. The periosteum of the orbit joins that of the anterior surface of the maxilla at the infra-orbital ridge, and this latter periosteum is directly continuous with periodontal membranes of teeth at the gum margins. There is thus bony and periosteal association of orbit and jaw.

The *arterial* supply of the periosteum and tissues of the lower half of the orbit comes from branches of the maxillary artery, which also gives branches to the alveolus and palate.

The alveolar *veins* join those of the periosteum and mucous membrane of the antrum, and then anastomose with the facial and orbital veins. Also, in the periosteum of the anterior surface of the maxilla and alveolus there are veins which empty into the anterior facial vein. This has direct branches to the superior and inferior ophthalmic veins. Accordingly, we have direct venous connexion between alveolus and orbit.

The *lymphatics* of the eye and teeth empty into superficial and deep facial lymphatics. Some of these spread from the inferior orbital ridge over the face and downwards to collect in the submaxillary gland.

Others collect in the pre-auricular gland, which in eyelid and conjunctival infections is swollen and tender.'

Bearing these anatomical associations in mind—osteal, periosteal, vascular and lymphatic—it is not surprising that pathological conditions of the eye dependent on dental disease arise. Rather, the surprising thing is that they do not occur more frequently.

The ætiology of many cases of inflammation of the eyeball is still obscure and offers a fertile field for investigation. The conditions in which a dental connexion is often suspected are iritis, cyclitis, combinations of these two, and uveitis; and the importance of the elimination of dental sepsis, especially the latent variety, is very great in view of the anatomical factors.

The following cases have come under particular notice, and I am indebted to Major J. H. Gurley, O.B.E., for the notes on each :—

Case 19.—Sister Miss D. Admitted March 27, 1923.

Condition.—Irido-cyclitis, right and left.

Left eye first inflamed 1911 (two months).

Right eye first inflamed 1917 (six months).

No systemic abnormality after careful routine examination.

Both eyes inflamed for four weeks before admission.

Vision.—Right $\frac{6}{24}$, left $\frac{6}{24}$, and the left eye showed ciliary infection.

Local routine treatment begun, and patient sent for dental report.

Dental Condition.—Twenty teeth standing, all involved in pyorrhœa. $\underline{|2}$ flush-crowned; $\underline{|1}$ discoloured; had large porcelain filling and obviously root-filled. $\underline{4|}$ broken septic root. Radiograms showed ill-fitting flush crown on $\underline{|2}$ with marked bone infection and *perforation* of side of root by the metal post. $\underline{|1}$ marked absorption of apex and bone infection. Bone recession characteristic of pyorrhœa about one-third depth of socket.

Treatment.—$\underline{|12}$ extracted first, both very foul. Remainder in four sittings, last on April 12, 1923.

Result.—April 28, 1923. Vision clearing: Right, $\frac{6}{18}$; left, $\frac{6}{24}$. May 5, 1923. Vision clearing: Right, $\frac{6}{12}$; left, $\frac{6}{24}$. Vision of left eye is probably permanent at $\frac{6}{24}$ in view of following detailed report: "Two broad posterior synechia in position of 4 and 8 o'clock; fine organised lymph in papillary area. Vitreous is full of opacities. Fundus is only seen indistinctly."

Patient, after six months' leave, went to Egypt, where eye specialist reported right eye normal $\frac{6}{6}$, left as before $\frac{6}{24}$.

Note.—(*a*) Flush crown inserted in $\underline{|2}$ in 1910, and left eye was first affected in 1911.

(*b*) Periapical sepsis + localized injury to periodontal membrane by post pushed through cementum, leading to extensive changes in bone.

(*c*) $\underline{|1}$ was root-filled at same time (1910).

' Condensed from "Oral Sepsis from Viewpoint of Ophthalmologist," by A. S. Tenner, New York. *Oral Topics*, March, 1925.

(*d*) Probable connection between $\underline{|12}$ and left eye.

(*e*) Pyorrhœa complication causing a vicious circle.

(*f*) Comparative rapid recovery of right eye.

Case 20.—Captain L. Admitted May, 1923.

Condition.—Acute choroiditis left eye and old choroiditis right eye.

History.—In 1918 right eye first involved and treated for two months. Left eye involved and treated on and off till 1923, when vision improved from $\frac{6}{12}$ to $\frac{6}{6}$.

Present Condition.—Right $\frac{6}{9}$; normal except for small scar of old choroiditis. Left $\frac{6}{24}$; vitreous haze; patch of acute choroiditis above and to inner border of disc and also old healed patches above disc.

Dental Report.—Examined and found to have a particularly clean and healthy normal mouth in every respect, but $\underline{2|}$ was flush-crowned. Crown fitted exactly; there was no apparent external or radiological evidence of any abnormality and extraction was not advised.

Nose, etc., normal; lungs, digestive tract, heart, urine, were all normal; Wassermann negative; blood normal.

Under routine treatment vision remained as above, and patient discharged on leave for two months, *during which he was persuaded to have* $\underline{2|}$ *extracted.*

On return from leave, considerable improvement was noted as follows: Right $\frac{6}{9}$, left $\frac{6}{12}$, with vitreous much clearer and patches of choroiditis nearly healed. Vitreous eventually cleared and vision of left eye became $\frac{6}{6}$ and choroiditis cleared without further treatment.

Note.—(*a*) In view of particular interest in this case, particulars of $\underline{2|}$ were obtained from dental surgeon who extracted it, and he reports it was definitely septic with foul odour both externally and internally.

(*b*) Tooth was on right side, while left eye was chiefly involved.

(*c*) No other possible cause was discovered despite every clinical and bacteriological examination.

(*d*) $\underline{2|}$ appeared clinically and radiologically sound.

(*e*) The need for removal of every crowned tooth, however sound it may appear, when there is systemic disease.

(*f*) $\underline{2|}$ is the smallest tooth in upper jaw and was the only one with root treatment.

(*g*) Probably a case of high virulence with "elective localization" (Rosenow).

Case 21.—Captain C.

Condition.—Irido-cyclitis right eye. Vision, right $\frac{6}{9}$, left $\frac{6}{6}$. Right eye showed K.P. on cornea and fine vitreous opacities.

Dental Report.—Extensive bridge work (union of two crowns by one or more dummies to fill up gaps between teeth), from $\underline{8\ \ 5|}$ and $\overline{876|}$ gold-crowned, and discoloured $\overline{1|}$ without filling.

Treatment.—All crowned teeth removed, with considerable improvement, but patient was loth to part with $\overline{1|}$ though it was definitely infected.

After two months, $\overline{1}$ was extracted, and in four weeks whole condition cleared without further treatment.

Note.—(*a*) $\overline{1|}$ is the smallest tooth in lower jaw.

(*b*) It was a highly septic and infective tooth, judging by odour, appearance and extensive bone infection as revealed by X-ray. Probably organisms of high virulence.

(*c*) Condition did not clear till its removal.

(*c*) *Affections of Ear.*

A toxic neuritis of the eighth nerve, in which the focus is the teeth, sometimes occurs. The eighth nerve supplies the organs of hearing and balance, and when these are affected there may be partial or complete deafness, with intact membrane, and giddiness, staggering and unsteadiness. Both or one organ only may be involved in the neuritis.

Case 22.—Cpl. N., Military Foot Police, aged 35.

While on duty was seen to stagger, fall into the road, and was presumed to be drunk. No smell of alcohol and no signs of drunkenness found on close investigation, and he was admitted to hospital for giddiness without impairment of hearing.

Dental Condition.—Extensive pyorrhœa complicated by acute ulcerative gingivitis. No crowns; no root fillings; no caries.

Treatment.—Twenty-three teeth extracted; marked reactions followed first extractions, so remainder removed at intervals.

Result.—Decrease in symptoms before last extraction and eventual complete recovery.

(*d*) *Affections of the Throat.*

This connexion is so obvious that it hardly needs mention. The constant passage of grossly infected food and saliva over the tissues of pharynx leads to obvious local pathological changes.

The importance of the elimination of dental sepsis in all throat conditions is generally recognized, and at Millbank it is the routine procedure.

It is particularly important before tonsillectomy, for the removal of tonsil leaves a comparatively large granulating surface easily infected in the first few days after operation.

(*e*) *Affections of the Nose and Sinuses.*

Just as in the eye and antrum we considered the anatomical relationships, so in these affections must they be borne in mind.

Those distressing chronic catarrhs which do not respond to local or vaccine treatment are often profoundly affected by the removal of latent sepsis in the mouth, especially in the anterior teeth.

The same remark applies to chronic conditions of frontal and ethmoidal sinuses.

No cases worthy of record have occurred.

(*f*) *Neuralgia.*

This term embraces affections of particular nerves and also vague headaches.

Case 22.—Serjeant N., aged 34.

In hospital five weeks with persistent unilateral headache on the right side, for which no cause could be discovered in the nose, antrum, accessory sinuses, eyes or ears. No constitutional abnormality discovered.

Kept on aspirin, etc.; diminution of pain but no cure.

Passed, after five weeks in hospital, for any possible dental connection.

Dental Report.—All teeth sound except $\underline{6|}$ which had a large filling, gave clinical signs of chronic periapical infection. Radiograms showed obvious infected bone and marked absorption of root. Tooth extracted at once and found to be very foul, and though root-filling had been well done, the whole apical portion of each root showed marked pathological changes. Periodontal membrane was burnt off; tooth passed through flame and found to be very foul when cracked open.

Result.—Pain ceased following day. Patient discharged on four weeks' leave, and on return reported no pain at any time and no recurrence during a period six months after.

Note.—(*a*) Apparent causal relationship; (*b*) small focus of infection; (*c*) tooth on the same side as condition.

Five other cases of this nature came under notice and need not be recorded, but the necessity for *early* elimination of any dental sepsis in every case of unilateral neuralgia with no discoverable cause must be emphasized.

As regards acute neuralgia of the tic douloureux type, one case must be recorded of special interest.

Case 23.—Recruit A., aged 19.

Only at depot three weeks when paroxysmal and very acute pains developed in the region of the right wisdom tooth, rapidly involving the three branches of the fifth nerve, with connected symptoms.

Sent immediately to Millbank, arrived 1 p.m., and given morphia, as severity of pain was such that patient had to be restrained from injuring his head by bumping it against a wall.

Seen 9 a.m. next morning. Impossible to examine mouth as trismus reflex was marked. Given general anæsthetic and mouth forced open.

Dental Condition.

$\overline{76|}$ broken down septic roots.

$\overline{8|}$ sound and just about to erupt.

$\underline{765|}$ extensive caries.

$\underline{8|}$ not yet erupted.

Remaining teeth good.

Treatment.— $\frac{765|}{876|}$ extracted.

Result.—Very marked reduction in pain on recovery from anæsthetic. Within twenty-four hours patient was sitting up and eating ordinary diet on left side.

Complete and normal recovery, and discharged three weeks after admission.

Note.—(*a*) Probably direct inflammation of inferior dental nerve by toxins from $\overline{76|}$.

(*b*) Sudden onset and severity, though it was obvious the teeth had been septic for a long period.

(*c*) Early age.

(*d*) Rapid recovery following removal of teeth.

These twenty-three cases recorded are selected from a large number over a period of three and a half years, and though it is not claimed that the dental condition was a direct cause in every case, the connexion between systemic and dental conditions is sufficient to warrant the assumption that the former was profoundly influenced by the latter.

The somewhat large variety of conditions may have some explanation in Rosenow's elective localization theory, and we may express them as follows :—

$$\frac{\text{Virulence} + \text{toxin dosage} + \text{time-factor}}{\text{Resistance}} + \frac{\text{(?) elective localization}}{\text{path of systemic infection}} = \begin{matrix}\text{Systemic}\\ \text{effect}\end{matrix}$$

I cannot conclude this section better than by quoting S. Colyer :[1] " The somewhat bizarre nature of the effects that have been attributed to dental sepsis may at first sight make the relationship appear improbable, overstated and even ridiculous ; but when once the principles that underlie the subject have been grasped, it will be realized that the conclusions are a necessary outcome. In all diseases there are always two factors at least, the seed and the soil, without which disease cannot exist. The seed varies, the soil varies ; never are the two the same ; never is the relation repeated. This is why variation in disease occurs, and in no two persons does it run a precisely similar course. Dental sepsis, let it be repeated, is but a comprehensive term to include various forms of septic conditions of the teeth ; it is not a disease. The germs causing the sepsis vary, and so the germs passing into the body, and the toxin absorbed, produce different results in different people. It cannot be said precisely why germs of a particular kind entering one body produce a septicæmia, and in another an infective endocarditis ; or why a toxin in one will produce anæmia and in another a neuritis. An explanation may be forthcoming when we understand more thoroughly the part played by inborn factors in the production of disease and the selected affinity of micro-organisms or their toxins for certain groups of cells."

[1] Concluding remarks to the chapter on "Oral Sepsis" in "Science and Practice of Dental Surgery," by Norman Bennett.

General Conclusions.

The medical and dental services are called upon to treat three main groups of patients, each presenting different types and degrees of dental sepsis with resulting variations in the systemic effects.

These groups are :—

(1) Soldiers.

(2) Officers and members of Nursing Service.

(3) Wives and children.

Group 1 receives early, systematic, and continuous treatment.

Group 2 receives limited but systematic treatment.

Group 3 receives reduced and disconnected treatment.

Group 1.—Soldiers.

The recruit joining the Service to-day receives early dental treatment at his depot. At the outset tartar is removed, teeth polished, and all roots and septic or unsaveable teeth are extracted, thus eliminating at once dental sepsis as defined in this paper. Carious cavities are treated and filled with permanent material, and every endeavour is made to render him dentally fit before he leaves the depot as a trained soldier.

Subsequently, whenever the exigencies of the Service allow, he will be dentally examined annually and receive conservative treatment when required. Theoretically, therefore, such a soldier should present no dental sepsis at any time during his service.

The trained soldier who passed into the Army from the depot before this intensified treatment was inaugurated was not necessarily dentally fit, and his treatment is subsequently carried out on the same lines by the dental officer of his regiment. This officer has at least 2,000 troops in his area, apart from wives and families, and his waiting list numbers hundreds. It follows that there are many cases among these where dental caries progresses till pulp infection is established which involves the periodontal membrane and brings about latent dental sepsis, as previously defined. When such conditions are acute, as in alveolar abscess, or cause pain, the soldier reports "sick" and the tooth is extracted at once, thus removing a focus of streptococcal infection.

But no pain or other local sign may result, and it may be months before this soldier on the waiting list is sent for. During this period there has been constant toxin dosage, and when such a patient comes into hospital for any systemic disease, it will be obvious that the dental sepsis, acting over a more or less prolonged period, is of great significance as a contributory factor in the condition, and the need for its early removal is apparent. It follows that as these older soldiers who have not passed through the treatment at the depot leave the Service and are replaced by recruits made fit before joining their unit, such dental sepsis cases will tend to diminish both in number and extent.

Army treatment excludes crowns and conservation of grossly infected teeth, and devitalization of pulp with subsequent root-filling is strictly limited to those important teeth with sound walls in which there is every prospect of success.

A study of a large number of cases over a long period reveals that in the young soldier pyorrhœa as such is either absent or very rare, and the main condition is simply latent sepsis, via the internal path of infection of periodontal membrane, due to untreated caries, with absorption of toxin by the lymphatic channel producing generally a well-defined and localized constitutional lesion.

In the older soldier pyorrhœa becomes more common and is frequently complicated with latent dental sepsis, the resulting systemic effects being an expression of various phases of the "pyorrhœa complex."

Group II.—Officers and Nursing Staff.

Conditions here are totally different. While this group must be within a certain dental standard on joining, there is no examination and treatment systematically pursued as in the soldier. Before the formation of the Army Dental Corps all such treatment was private, and this explains the frequency of the crowns and root-fillings in their mouths. Their treatment is very limited on account of the little time which can be spared for them, but every endeavour is made to render them fit, though only a small number can be treated as compared with the soldier.

In the twenty-three cases recorded previously, the predominance of this group is very striking, for only seven belong to Group I, though there are seven wards in the hospital for soldiers and only two for the second group. Of hospital patients sent for treatment, it is found that Group II supplies about six times as many as Group I.

When it is considered that in nearly every case of Group II the type of dental sepsis is of the latent variety and that root-filled teeth predominate in these cases, in which the crowned tooth is extremely frequent, the severity of their condemnation is explained.

The recognition by the dental profession of the dangers of the conservation of putrid teeth is comparatively recent, and it follows that those younger members of Group II joining the Service to-day will present both fewer and more scientifically prepared root-fillings, with a corresponding reduction in latent sepsis and a profound reduction in the percentage incidence of dental sepsis cases.

As regards the disease equation previously described, the resistance in each group is considered equal because each is presumably physically fit, but the question of age must be taken into account. Group I leave the Service at a much younger age than Group II, and various factors contribute to lower resistance with advancing years.

Group III.—WOMEN AND CHILDREN.

While these hardly enter the scope of this paper, they are nevertheless worthy of mention because so often their systemic condition is profoundly influenced by dental sepsis. It need only be mentioned that streptococcal infection as herein described is bound to affect seriously the health of the pregnant mother and also the fœtus.

The general ignorance of the importance of the temporary dentition is amazing, and frequently abscessed milk teeth are left untreated because it is thought that, as they are only temporary and are replaced by sound teeth, they cannot be of much harm. The usual teeth affected are the molars, which are not normally shed till the age of 10 or 11, and as these are frequently abscessed at the early age of 7 or 8, the absorption of streptococcal toxin for a long period, at a time when rapid growth is taking place, must of necessity cause serious harm.

Sufficient has been said in this paper to emphasize the great significance of dental sepsis and its association with so many of the conditions which the medical officer treats. The importance of the *early* elimination of dental sepsis in these lesions cannot be exaggerated. Ideal conditions are now present in the larger military hospitals for that close co-operation between medical and dental services which is so vital if the facts presented in this paper are carried to their logical conclusion.

If this paper fosters this co-operation in any way, its object will have been achieved.

In conclusion, I should like to mention that, in the Dental Department of the Queen Alexandra Military Hospital, there is a large number of teeth specially mounted to show various pathological changes and numerous odontograms taken by Major McGrigor, which indicate bone infections of all varieties ; and also the teeth and radiograms of many of the cases herein recorded, which any medical officer interested in them may study at his leisure.

The medical notes on the cases recorded are published by kind permission of the Officer Commanding, Lieutenant-Colonel H. F. Shea, D.S.O. I am indebted to Major R. E. Todd, Medical Specialist, for his assistance in the preparation of these notes, and also for his enthusiasm in the campaign against dental sepsis.

I wish to thank Major D. B. McGrigor, O.B.E., Radiologist, for his keen co-operation. The reproduction of odontograms is a difficult and expensive matter, and it has not been found possible to illustrate the cases recorded, but the great importance and value of the radiogram are indicated in the paper.

The bacteriological investigations and vaccine preparation were carried out in the respective departments of the Royal Army Medical College by kind permission of Lieutenant-Colonel H. M. J. Perry, O.B.E., Professor of Pathology. The former were undertaken by Major J. A. Manifold,

D.S.O., and Captain J. S. K. Boyd, and the latter by Major C. J. Coppinger. I am greatly indebted to these investigators for their results, which are duly recorded.

I am grateful to Sir J. F. Colyer, K.B.E., F.R.C.S., L.D.S., for his kind permission to quote extensively from his standard textbook, " Dental Surgery and Pathology," 1923 (fifth edition).

As regards the illustrations, I am specially grateful, firstly, to the Dental Board of the United Kingdom for the loan of the blocks for figs. 1, 2, 3, 5 and 6, which are taken from "Lectures on the Diseases of the Periodontal Tissues due to Infection, in their Relation to Toxæmia," delivered under their auspices in 1923; and figs. 4, 7, 8 9, 10, 11 and 12 are from blocks obtained from Messrs. Longmans, Green and Co.

Lastly, it remains for me to express my grateful thanks to Lieutenant-Colonel J. P. Helliwell, C.B.E., Inspector of Dental Services, for reading the manuscript and offering numerous valuable suggestions.

SOME FACTORS INFLUENCING THE LOAD OF THE SOLDIER.

By Captain D. G. CHEYNE, M.C.
Royal Army Medical Corps.

The subject of clothing and equipment, uninteresting as it may sound, is one which, in the hurly-burly of so many pressing problems, we might think could be left with safety in the hands of the Clothing and Ordnance Departments. This is an entirely wrong point of view.

The manner in which a soldier is clothed and equipped may, in fact actually does, govern the whole of his future conduct, and on that conduct the success or otherwise of operations may depend.

More work has, perhaps, been done on this subject than on any other in hygiene, yet in no other department has less regard been paid to scientific findings. It is over thirty years since it was decided that the optimum load for the infantry soldier is between forty and fifty pounds, and yet in the late war we found that the load of the soldier was always steadily creeping up; in many cases it was far beyond the optimum third, and in some cases it must have been periously near 75 per cent of his body weight.

Before criticizing this load and the causes which lead up to it, it is desirable to refer to Lothian's article on this subject; he gives a complete story from the earliest times. This work of Lothian is not sufficiently known to the officers of the Corps. He cleared the way and laid the foundation, but the structure is far from being complete. One of the outstanding features in Lothian's paper is the evidence he brings forward to show that the loads supposed to have been carried in other days by the soldier were not in actual fact carried at all—that is in the case of the soldiers who were supposed to move, for the old encased soldier was not mobile.

The mobile soldier was surrounded by followers, including women, who did the carrying for their heroes.

In the South African War the official equipment was just over sixty pounds, but in actual practice this was greatly reduced by the soldier himself who threw away what he did not want.

The comment of an Italian, quoted by Lothian, is worth repeating. He says: ". . . having arranged a proper transport, independent of the railways . . . they made the infantry march as they had never marched before, not paying much attention to whether the officers and men had their regulation baggage with them every day. By this means they were enabled to pursue and capture Cronje."

It is the first few words of the extract that contains such a volume of good sense. . . . "Having arranged a transport, independent of the railways" . . . What a text for a sermon! I shall return to this later.

The official equipment was revised in 1907 and reduced to 54½ pounds; in 1908 the web equipment came in and the load rose to 59½ pounds. With the outbreak of war the load received ever-increasing additions, until it became seventy to eighty pounds, varying with the season.

In considering this subject it is well to bear in mind the factors governing clothing and equipment. These are as follows:—

(1) The soldier's weight.
(2) Climate.
(3) Nature of warfare, savage, civilized.
(4) Amount of work to be done, mobility.
(5) Transport available.
(6) Nature of roads.
(7) Accessories for fighting.
(8) Influence of gas.

It is under these various headings that the matter will now be considered.

(1) The Soldier.

It has been said that the idea of a soldier's optimum load being one-third of his body weight is no new one. We ought to have appreciated this fact long ago from our knowledge of animals. I doubt if a C.O. would ever permit the overloading of his pack animals, be they asses or elephants, yet that same officer loaded up his men far beyond their limit. It is a wonderful thing that though these men, unlike the beasts of burden, could complain, yet they rarely did.

It is obvious that clothing and equipment must be standardized. We cannot fit the load to the man, therefore we must fit the man to the load. This fact governs questions of weight and development of recruits, and it is universally recognized. Cathcart, Richardson and Campbell in their Report to the Army Hygiene Advisory Committee on the maximum load to be carried by the soldier, lay down definitely that the maximum load is 33⅓ per cent of the body weight. This is no haphazard guess work. It is work, calculated by sound, well-proved and accepted methods. Taking a soldier of 135 pounds—a good, average weight for a young man—and allowing 14 pounds for his clothing and boots, we are left with a load of 31 pounds for actual equipment. At the moment, the weight of the load, excluding the weight of clothing is 41 pounds 6¾ ounces. If we add 14 pounds for the weight of clothing, excluding the greatcoat, we get 55 pounds 6¾ ounces. A man to carry this weight should scale 150 pounds. I submit that we do not get recruits of anything approaching that weight, nor are we likely to for several years. I put this period at a few years, as it is undoubtedly true that people who spent their youth or adolescent

periods of life during the war years, did lose something in their diet, especially fats and the like. Industrial classes suffered more in this respect than did the rural classes, and it is to be remembered that it is from the former classes that recruits come. In former days, the converse was the case. If the recruits are not forthcoming, and if we accept the above findings, as we are bound to do, it is absolutely necessary that the load must be reduced. This load includes, as fighting necessaries, the rifle and ammunition. Additional articles, which may amount to anything, will be referred to later.

Something must be done to reduce the expenditure of energy by minor adjustments, but these sink into relative insignificance when compared with the major problem. I refer to Cathcart and Lothian's work on the subject—"History of the War—Hygiene," vol. ii, and my own contribution to this subject, ROYAL ARMY MEDICAL CORPS JOURNAL, January, 1926.

(2) CLIMATE.

The climate of the country in which troops are operating has a great influence, but modern warfare, being what it is, adequate allowance evidently cannot be made for this. True, clothing may be modified or reduced, but the necessaries for war remain constant, or depending upon the country, may actually increase. The influence of climate, temperature and humidity, on the dissipation of heat is obvious and only adds to the difficulties which may have to be met.

(3) NATURE OF WARFARE.

This is of importance, only in so far as it has a bearing on the other factors, i.e., variations of climate, quality of roads, nature of transport, and weapons of war employed, etc.

(4) AMOUNT OF WORK TO BE DONE.

The work of the soldier up to the present time has been described in one word—"marching." Every other part of his work is subsidiary to this. "It is his daily bread. Fighting is a luxury" (Lothian). His whole training is arranged with this end in view—to be able to march with a load to the scene of action, and having arrived there, to destroy the enemy. From every side we hear the cry, "Forget the last war; concentrate on mobility." Mobility has been described as the soul of warfare. Everything is considered in terms of mobility, except the unfortunate soldier, who remains about as immobile as possible without being buried under his own load.

There are innumerable examples in history of the success of mobility, and in the late war there are many and glaring examples of failure, due to lack of mobility. Armies were saved because an enemy had come as far as he could. He was no longer mobile, due perhaps to the exhaustion of the troops or to the lack of transport, especially for food. Want of food and

physical exhaustion produce the same result. At any rate, it was the loss of mobility due to some cause which was the deciding factor. It is surprising to find that towards the end of the war troops were able to march only some $5\frac{1}{2}$ to $7\frac{1}{2}$ miles under their existing loads, even under the stimulus of victory and chasing a wearied enemy. Mobility at the very time when it was a crying necessity was a lost art.

(5) Transport Available.

The well-known methods by which in the past attempts have been made to reduce the load are: (1) reducing the number and weight of individual articles; (2) carrying whatever is possible on transport. Of the first method, the abolition of the entrenching tool is an example.

Transport was available on liberal lines in the late war, yet it was always needed for something, presumably more important than carrying soldiers' equipment.

Can we hope for better things in the future? It is doubtful.

True it has been arranged that greatcoats will be carried in transport, but I think all of us can conjure up visions of situations where every particle of transport will be required for far more important things than greatcoats, such as ammunition, food, wounded men, stores of various sorts.

Too much stress should not be laid on mechanical transport as we knew it in the late war. We may confidently expect developments in aerial transport, but with a large force involved, it is doubtful whether this would be of much use in the forward area. The anti-aircraft policy of the enemy would see to that, unless our superiority in this direction were overwhelming.

(6) Nature of Roads.

We have to consider the nature and extent of roads, for on these will depend the amount of transport which can be used, and the possibility of some transport being available for what might be called the physiological needs of an army, i.e., assistance in load-carrying. Roads can take only a certain amount of transport—that amount, I suppose, only transport experts can assess.

Although in this country a scheme of large arterial roads is being worked out, we cannot allow this to dominate our policy in countries where few, if any, such roads exist. Nowadays, of course, we are approaching an era when transport may be independent of roads, i.e., by using the air, or by using transport in the form of tanks. The tank idea is capable of great development in many ways, and we, of the medical services, must watch this and keep pace with these developments, so that we may avail ourselves of any advantages offered.

(7) Accessories for Fighting.

Of these I am not competent to write. They include ammunition, rifle, bayonet, grenades, rocket apparatus, gas respirator, and a host of other articles which may conceivably be added to aid the fighting powers of the individual or to resist the inventions of the enemy. The point is that the staff should appreciate the fact that any additions *can only be permitted* when an equivalent weight has been discarded, or arrangements made for its carriage otherwise than on the soldier, that is to say, if the Staff wish the force to remain a mobile one, capable of striking at a moment's notice. I am still thinking of the mobility-soul-of-war theory.

(8) Influence of Gas Warfare.

It is difficult to discuss this subject, except in the most superficial manner, but, nevertheless, it is a factor which may quite well dominate any future situation and which may demand a considerable readjustment of our present ideas. The need for protective clothing, for example, may well call for some modification of our policy.

I have gone into these factors in order to show the difficulties which lie in the path of those who would seek to reduce the load. It is like the much-desired reduction in national expenditure where every reduction is opposed by the people it hits. Every reduction in load is going to hit someone or the theories or policy of some one, i.e., the soldier or G branch especially, with, of course, the physiologist always in the background, clamouring for these reductions and resisting to his utmost any attempted increase.

Let us first consider the soldier's clothing. Can any reduction be made? Lurking in the background for the moment, but ready to spring with an irresistible force is *public opinion*, to which we may be forced to give in. This increases the difficulties, and it becomes our duty to educate *public opinion.*

As a first question, it may be asked: Is it necessary that the soldier should wear very thick underclothing? It may be the habit in industrial classes.

Why should not the soldier be taught to produce his own heat, instead of depending on many layers of thick undergarments? Thinner articles might not be so economical, but here is a case where it is clear that economical considerations should bow before physiological necessities. Ordinary people do not wear these thick undergarments. The "modern" woman has left the "thick-clad" age far behind, and is evidently healthier and stronger, as judged by physical achievements.

To come to details, I would suggest that the present under-drawers which weigh one pound should be replaced by drawers of a thinner material and of a pattern which does not reach below the knee. It is quite unnecessary to wrap the knees and legs with thick layers of material.

The important parts—the abdomen and the lumbar region—will still be adequately protected. Apart from this, loss of heat will be facilitated by the freer ventilation of the area round the knees, which will then have only the covering of the trousers, which will be quite sufficient. Many men now do not wear the regulation underclothing, preferring to buy thinner garments for themselves.

The question of the retention or not of the greatcoat is a vexed one, and the authorities have evidently compromised by retaining it, but legislating for its carriage in transport. I have already said something about the availability of transport under all circumstances. Supposing the transport on which the coats are being carried ceases, for some reason, to be available at a time when it is separated from the main body of men, a difficulty at once arises. Imagine too the difficulty which might arise in sorting out 800 coats at a given time. In an emergency we must meet situations as they arise. Some other protection must be given to the men in the form of a waterproof cape, if the principle of separating a man from his immediate belongings is accepted, which it has been.

I suggest that if such a cape as was used at the end of the War—a combined ground-sheet and cape—were used, the greatcoat might be dispensed with altogether. As a night wrap, its benefits might almost equal those of the greatcoat. The existing ground-sheet could then go. The weight of such a coat is less than half that of a greatcoat.

There is a need for some sort of a portable shelter in our Army, and if the force is to be a highly mobile one, that need will become more pressing, especially if such a force is not to be encumbered with heavy tentage. It is just possible that a shelter for two men might be made from two such cape ground-sheets, using small light poles as a support. Public opinion may conceivably be shocked at a proposal to abolish greatcoats, but this would appear to be a case where the subjective feelings of the soldier should ultimately influence public opinion.

That the soldier will only throw away such articles as encumber him at a time when his efficiency is the all-important feature, may be accepted. If, however, he has a light cape which he can dispose of in his pack or haversack, this tendency might be counteracted.

Smaller things may be considered for a moment. The cap-comforter is a doubtful comfort. It is objectionable, and is not used in wet weather by the men. If it is used at all, it must be a reflection on the lack of suitability of the cap, which, therefore, should be altered to make it suitable. The housewife might very well be reduced to one per company. Soldiers do not mend their socks as much as formerly, with the advent of cleansing and laundry units; and one repairing outfit at company quartermaster stores would be adequate for the work of sewing on buttons—which must be the chief function of this article.

Following on the introduction of a new emergency ration, a saving of a further one pound will be effected. But with a reduced available ration it is

all the more necessary that adequate precautions should be taken to ensure food supplies. Increased mobility of the force will augment those transport difficulties, and if food transport suffers, then mobility must also suffer.

Further economies in the weight of the load which can be effected by lessening the weight of clothing and equipment mentioned, seem impossible, but the diminution of the load by the changes already indicated seem considerable.

The field ration is adequate for all purposes; the unconsumed portion will be carried as at present.

The only modification of equipment which can be suggested is in the pack, and in the sealed pattern—incorporated in the Mill's equipment—the idea seems to have been anticipated.

The question of the pattern of the pack and method of carriage is intimately bound up with the greatcoat question. The Mill's equipment consists of a pack in two separate parts—one presumably for the coat, though I have seen pictures of this equipment showing the greatcoat rolled and hung round the pack; the other part for the remaining articles which have to be carried in the pack. The greatcoat portion may be disregarded. How the greatcoats are to be carried in transport has not been indicated; but I presume a container is unnecessary.

With the proposed introduction of a new emergency ration, replacing the old bulky iron ration, the question of the pack will require revision. A feature of the Mill's equipment is the ease with which the packs may be detached, leaving the man with his ammunition, etc., ready for action. It is impossible to separate him from his emergency ration, which must, therefore, be carried in the haversack—which is intended. We are left, therefore, with the following articles for the half-pack:—

Cap-comforter	Holdall	Housewife	Mess-tin
Ground-sheet	Socks	Soap	Towel
Oil-tin			

Total weight = 6 lb. 15¾ oz.

If the cap-comforter, housewife and ground-sheet are discarded, the weight will be 2 pounds 13¾ ounces, but it will be necessary to add the weight of a cape-ground sheet. This may be taken as equivalent to the present ground-sheet—total weight 6 pounds 9¾ ounces.

The distribution of such a load as has been outlined will then be as shown in table on next page.

This is roughly a saving of four pounds on the existing weight, as laid down in official tables.

For purposes of balance, the lateral and front portions of the load may be considered as one. This gives a weight of 14 pounds 9 ounces against 12 pounds 7¾ ounces on the back. The rifle, braces, etc., have been disregarded in the calculation.

This difference, if anything, is desirable, as such personal articles as

the soldier might desire would probably find a place in the pack, and so make the balance more perfect. At the same time the principle of higher carriage of the soldier's load has been attained.

The only article which has not been legislated for is the blanket. The occasion when this would be required to be carried by the man would be in a special emergency, in which case it would be carried on the back in lieu of the pack.

Clothing (9½ oz. have been taken off the total weight laid down in Field Service Manual, 1924, on account of reduction suggested).

	lb.	oz.
Clothing	14	0
Lateral Balance—Bayonet scabbard	1	9
Haversack	1	9½
Unconsumed ration	0	15
Emergency ration	1	4
Water bottle	1	6
Water	2	8
Front—Ammunition and carrier	5	6
Back—Pack (weight of half)	0	13½
Contents of pack	6	9¼
Box respirator	2	15
Steel helmet	2	2
Rifle	8	14
Waist-belt, braces, etc.	1	5
Total weight	51	4¼

I have attempted to focus attention on the load of the soldier, as it compels consideration, for many are the ills which may be attributed to overloading. Every effort should be directed to obviate this in the future, and to render an army really mobile.

REFERENCES.

LOTHIAN. "The Load carried by the Soldier," Army Hygiene Advisory Report, No. 1, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, 1922.

CATHCART, RICHARDSON, CAMPBELL. "On the Maximum Load to be carried by the Soldier," Army Hygiene Advisory Report, No. 3, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, vol. xl, 1923.

CATHCART and LOTHIAN. Quoted in "History of the War Hygiene," vol. ii, pp. 126-127.

CHEYNE. "The Load of the Soldier—a Plea for its Higher Carriage," JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, January, 1926.

A MICRO-CHEMICAL TEST FOR CHROMATIN.

By H. M. WOODCOCK, D.Sc.Lond.

Fellow of University College.

(Medical Research Council grantee ; Jenner Memorial Research student.)

(Lister Institute of Preventive Medicine.)

The best method for demonstrating chromatin hitherto available to microscopic workers has been the classic one of the addition of dilute, acidulated methyl-green to the fresh, unfixed cells. The same stain is also very serviceable for material fixed in certain ways, as it is used in the Ehrlich-Biondi-Heidenhain combination. But, elective (for practical purposes) as is methyl-green, and though I have found it to be most useful in the course of my own work, it has one or two drawbacks, when the question is not so much of staining, with a view to distinguishing nuclear material the presence of which is known, as of determining whether a particular body or granule contains or consists of chromatin. In the first place the method remains purely a staining process; it is not in the nature of a precise microchemical test such as is available for the microscopic detection of iron, by means of the prussian-blue (or ammonium sulphide) reaction. Secondly, when examining minute granules, suspected of being chromatinic, one is sometimes in doubt as to whether a particular granule is faintly stained or whether an apparent greenish tint is due to an optical effect; in such a case a method of staining which is also a microchemical test is greatly needed.

I think, therefore, it is worth while to draw attention to a microchemical reaction, recently described, which promises to be a most valuable aid in the determination whether a body or granule does or does not contain chromatin. The method is known as Feulgen's nucleal-reaction, being based upon certain reactions of thymonucleic acid observed by him some years ago.[1] The method has since been further elaborated and experimentally tested by Feulgen and Rossenbeck (*Zs. Physiol. Chemie*, 135, 1924, p. 202), and Feulgen-Brauns (*Pflüger's Archiv*, 203, 1924, p. 415), to whose papers those interested may be referred for full details. The principle of the method depends on two chemical reactions. Firstly, by means of partial acid hydrolysis, certain purin-bodies, guanine and adenine, contained in the purin-nucleotides of thymonucleic acid, are broken down, so that reducing groups of carbohydrate-like constitution are set free. These carbohydrate groups are, according to Feulgen, of aldehyde nature. This is shown by a particular reaction given with fuchsin-sulphurous acid (Schiff's reaction), which has been found (Wieland and Scheuing) to be one

[1] In 1924, Feulgen published a paper (in German) on "New Methods for the Biological-histological Study of Cell-nuclei," etc. (*Ber. ges. Physiol.*, 22, p. 489.)

of the most infallible means of detecting aldehyde groups. By this reaction a dye or colour-body is formed of a red to violet tint; redder when seen in greater depth or thickness, more violet in tone when seen thinner under the microscope. The reaction is of great specificity. Sugars, for instance, do not give it, neither do pentoses, the latter being a point of practical importance in connexion with this new method (see below).

The details of the technique followed have varied slightly as improvements in it have been made. I give here the method adopted by Feulgen-Brauns, who has made exhaustive experiments to ascertain the optimum working conditions of both the reactions concerned. As regards the hydrolysis, the optimum for all objects, animal and plant nuclei, whether in sections or smears, is immersion in normal HCl, maintained at a constant temperature of 60° C. for four minutes. The operation is best performed in a beaker, heated over a micro-burner. The slides are then quickly rinsed with distilled water and placed immediately in the fuchsin-sulphurous acid solution. The mode of preparation of this reagent is as follows: One gramme of fuchsin ("Diamantfuchsin," Merck, or para-fuchsin) is dissolved in 200 cubic centimetres of boiling, distilled water (i.e., 0·5 per cent). The solution is cooled to 50° C., filtered, and to it are added twenty cubic centimetres of normal HCl. After further cooling to 25° C., one gramme of dry, chemically pure sodium bisulphite is added. As the bisulphite is dissolved, the solution gradually loses its fuchsin-colour and ultimately becomes of a slightly yellow tint. This reagent should be kept in a well-stoppered bottle in the dark. It is important that it should contain sulphurous acid in excess, otherwise the fuchsin tends to be dissociated, and the liquid takes on a reddish tint. It may be noted that the above composition of the reagent differs from Schmidt's formula ("Pharmac. Chemie"—II, Org. Chemie, p. 344, 1922), in that less HCl is used (0·36 per cent instead of one per cent), which is considered to be an advantage. Feulgen-Brauns found that the optimum period for the action of the fuchsin-sulphurous acid is, for all animal cell-nuclei, from one to one and a half hours, and for those of plants about three hours. The preparation is then well rinsed, either, if a thin section or film, with tap-water, or, preferably, especially if rather thick sections are concerned, with water containing SO_2 in solution. The composition of the SO_2 water is given as follows: 200 cubic centimetres tap-water, ten cubic centimetres sodium bisulphite, and ten cubic centimetres normal HCl. The preparation, if a smear, can either be dried or treated as are sections in the usual way, i.e., dehydrated with alcohol, cleared and mounted. The stain is remarkably resistant and permanent.

According to the workers, this nucleal-reaction is "of a specificity hitherto unknown" for chromatin; hence its great value. There is, however, one slight apparent difficulty, which will be mentioned below. There is no danger of "overstaining." Indeed, as Feulgen-Brauns remarks, the maximum stain-formation is the optimum, for when all the liberated

aldehyde-groups are united with the fuchsin-sulphurous acid to form the colour-body, no more can be formed. Hence, I would point out, as she also notes, that preparations can in some cases be left with advantage much longer in the staining reagent, up to twenty-hours, for instance. I have found that, in the case of muscle-cell nuclei, this longer period gives better results. One extremely important point is that no damage to the morphological character of the nuclei is caused by the hydrolysis, unless this is continued for a much longer time than is necessary. The resulting microscopic appearance is that seen after ordinary staining with chromatinic stains. As regards many types of tissue-cell nuclei, I can confirm this statement. Another great advantage of this method is that there is no possibility of mistaking iron-containing material or granules for chromatin: a mistake which may readily occur with one of the best of nuclear stains, namely hæmatoxylin.

As regards fixation, sublimate-acetic mixtures, and also Zenker's fluid, are noted as being very suitable. It is stated that material should not be fixed in formalin, as this is itself of aldehyde character. But I have obtained excellent results in the case of sections of nervous tissue, which had been fixed in formalin. Since the hardening process, through the changes of alcohol, removes all traces of the formalin, I fail to see any disadvantage in using this fixative. This brings me to the apparent difficulty, commented on by Feulgen and Rossenbeck. They found that sections of fresh material, on being cut with a freezing microtome, showed a diffuse coloration in the cytoplasm after treatment with the nucleal reagent. But if the sections were passed through the various grades of alcohol and embedded in paraffin in the usual manner, no such staining was evident after the treatment, the substance which produced it having been dissolved during the prior procedure. The authors conclude that there may be aldehyde bodies in the cytoplasm, which they regard as representing products of the normal metabolism. To get rid of these aldehyde bodies, they recommend leaving the sections for some time in strong alcohol (96 per cent), before bringing down to water for the test. Smears of blood, for instance, should be fixed in methyl-alcohol. In no case should they be fixed by heat if this test is to be used (see also below).

Most unfortunately, this nucleal reaction is not universally applicable. Not all chromatin gives the reaction; but all chromatin which contains thymonucleic acid. Strictly speaking, the method is, therefore, a test for thymonucleic acid. Now, yeast-cells do not give the reaction, because their chromatin does not contain thymonucleic acid, but a pentose-nucleic acid. I have tried the reaction several times upon *Saccharomyces cerevisiæ* in the hope that it might succeed, because I have been unable to obtain any good evidence of a discrete, properly constituted nucleus in yeast-cells. After staining with methyl-green, there is a diffuse coloration, as in the case of the ordinary bacteria which I have tried, and I consider that the chromatin is uniformly distributed throughout the protoplasm of the yeast-cell.

Further, hitherto no thymonucleic acid had been found in the nuclei of ordinary plant-cells, but now Feulgen and Rossenbeck have shown, by means of this reaction, that some plant-cells, at any rate, do contain thymonucleic acid (e.g., the cell-nuclei of a bean-embryo). As regards animal cells, muscle-cell nuclei have been found to contain thymonucleic acid in addition to inosinic acid, hence the reaction is also well given by their chromatin. Altogether very many types of animal-cell nucleus have been investigated, with positive result, and it is probable that the method may prove of general application in their case.

I should like to give, in conclusion, a few examples of the results of this reaction, as they bear upon work which I have done and my conclusions resulting therefrom. Feulgen and Rossenbeck state that they could not obtain the reaction in the case of bacteria, or in that of trypanosomes, but they obtained it in the case of ciliates. Certainly some bacteria do give it, as I accidentally ascertained. The test was tried by me on the spores of *Glugea lophii.* At the first time of trying, the only material which happened at the moment to be available was an emulsion in saline of a ripe spore-containing, cystic mass, which had been left standing some little time and had become contaminated. Smears were made, and as a result of the nucleal reaction the bacteria were definitely pinkish in colour, while there was no sign of colour in the spores. Miss Robertson kindly allows me to say that, similarly, the bacteria in her cultures of *Bodo* also give the reaction quite well. Again, as regards trypanosomes, Bresslau and Scremin (*Arch. Protistenk.*, 48, 1924, p. 509) have found that both the nuclear elements give the reaction, which is, indeed, particularly marked in the case of the kinetonucleus. These observations, I may also add, have been confirmed by Miss Robertson, in the case of the forms of the skate-trypanosome in the leech (*Pontobdella*). Moreover, in the case of the free-living binucleate, *Bodo* (*cf. saltans*) she also gets decisive positive results. These observations afford, I consider, strong evidence in favour of the view originally taken by Schaudinn, with which the late Professor Minchin and I always agreed, that the conspicuous, intensely staining body near the origin of the flagellum in the trypanosomes and allied forms is, in fact, of nuclear character; and Bresslau and Scremin also regard this point as now settled. Hence the terms of trophonucleus and kinetonucleus, which I originally proposed for the two nuclear bodies in the binucleates, are seen to be completely justified. Bresslau and Scremin consider that the failure of Feulgen and Rossenbeck to obtain a successful, positive result was due to insufficient duration of the hydrolysis; they found that, while hydrolysis for four minutes was unsuccessful, if the process were continued for six or seven minutes a positive result was obtained. Miss Robertson has suggested to me that the failure may also be in part due to fixation of the smears by heat, and this may apply to their failure in the case of bacteria also. Heating may alter the chemical composition of the nuclear material.

Further, in a recent paper (*Arch. Protistenk.*, 52, 1925, p. 394), Thiel

states that he has tried the nucleal reaction upon *Rickettsia melophagi*, with entirely negative results. Unfortunately, Thiel does not say whether his smears were fixed by heating or otherwise before applying this test, although, in connection with another point, he fixed them in formalin. And, in any case, until more is known as to whether bacteria in general give the reaction, i.e., contain thymonucleic acid in their chromatin, this negative result cannot be regarded as a proof of the absence of chromatin. Still, taken in conjunction with my failure to stain another "Rickettsia" (*R. pediculi*) with methyl-green, I think Thiel's observation is of considerable importance. [*Vide* also letter to Editor (p. 397) in this connection].

Lastly, in the course of my present work upon *G. lophii*, of the angler-fish, in relation to *Encephalitozoon*, and upon *Sarcocystis*, I have tried the nucleal reaction in all these cases, and in none of them have I been able to obtain a positive result. In the case of *G. lophii*, not only the spores have been tried, but sections of young cysts, containing much material that is not yet of the nature of spores. And that the reaction was carried out successfully is shown by the positive result in the case of the cell-nuclei of the surrounding nervous tissue. I will not say more upon this question here, beyond remarking that, in some smears of a true Microsporidian, *Thelohania* sp., from the larva of a mosquito, kindly given me by Dr. Wenyon, no difficulty was experienced in obtaining the nuclear material well stained, both in the early, spore-forming stages and in the spores themselves.

EFFECTIVE TEMPERATURES IN STERILIZATION AND DISINFECTION: A NEW METHOD OF CONTROL.

By Major E. S. PHIPSON, D.S.O., I.M.S.
Port Health Officer, Aden.

The standard methods of sterilization and disinfection by steam or hot air have one defect in common: there is no practical method of ascertaining to what extent the *interior* of a mass of material, whether surgical dressings or infected clothing, has been subjected to the influence of heat.

There are, of course, experimental methods by which this object can be attained. These include the thermo-couple, the resistance pyrometer and the electrical contact thermometer, but all these devices are too expensive, too cumbersome or too fragile to permit of general use for the purpose indicated. In recent years attempts have been made to obtain information regarding these interior temperatures by the use of tubes or packets of chemical substances, which, by a change in physical state or by chemical interaction, give evidence of having attained, at least momentarily, some particular temperature. During the past year, for instance, two articles have appeared in the *British Medical Journal* [1], [2], and one in the *Indian Medical Gazette* [3], in which the respective writers emphasize, from the surgical standpoint, the importance of interior temperatures in sterilization, and propose three different methods of obtaining the required information on a practical scale, but though these are no doubt reliable as far as they go, they all share the same defect in that the indicators can only be examined after the process, which purports to be sterilization, is over.

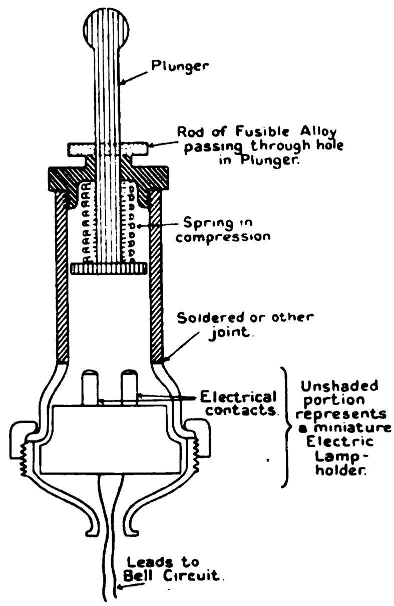
It will be conceded that scientific disinfection by heat should provide for the application to every part of a degree of heat which is known to be adequate for the particular purpose in view, and that the period of exposure to this degree of heat should not be materially longer, and of course no shorter, than is known to be necessary. A moment's reflection will show that none of the standard methods of disinfection in bulk can comply with these axiomatic requirements. A modern high-pressure disinfector, for instance, may be provided with a safety valve that blows off at a given pressure-temperature; its outer casing may bristle with thermometers, pressure gauges and elaborate automatic recording devices, but none of them is able to provide the answer to the fundamental question, "When does the least accessible part of the infected material reach an effective temperature?" The most they can achieve is to afford relatively valueless data regarding the degree of heat acting on the *outer* layers of the material to be disinfected; regarding penetration, the essence of practical disinfection, they are necessarily silent.

The purpose of the research recorded in this paper was to devise a practical and inexpensive method of determining the exact point of time at which the interior of a mass of clothing or other material in a sterilizer reaches a certain selected temperature. The device finally considered most

suitable took the form of a simple electric bell circuit, with the bell, a small dry battery and switch outside, and the two leads passing into the sterilizer or disinfector and terminating in a small heat-operated control, which is placed in the most inaccessible part of the mass of clothing. The control is a simple device by which the softening of a small bar of some substance which becomes plastic at a suitable temperature, allows a plunger actuated by a spring to bridge over the two projecting ends of the leads, and thus complete the circuit. The moment this is done the bell outside rings and continues to ring until switched off. The leads are of flexible wire and of any required length.

SECTIONAL DIAGRAM OF TEMPERATURE INDICATOR.

(Total length, 3¼ in.)



The substance employed in the earlier experiments was sulphur, but it gave very erratic results, which were unaccountable until a reference to an expert elicited the probable explanation: sulphur cast into bars is a mixture in uncertain proportions of three different allotropic forms, each with different physical properties. Sulphur being thus manifestly unsuitable, a series of experiments was then undertaken with the group of tin-lead-bismuth alloys known commercially as "fusible alloys." These were found very suitable for the purpose, and finally adopted.

Scope and Results of Experiments.—The range of temperatures employed in such procedures as disinfestation, disinfection and sterilization fall into three practical groups: those in the neighbourhood of 80° C., those about 100° C., and those above the boiling point of water, of which a range in the neighbourhood of 115° C. may be taken as a type. The scope of the experiments embraced the testing, under working conditions, of alloys

suited to each of these three ranges. The experiments were designed to test the reliability of the different alloys as indicators of temperature, and the controls were therefore temperature-controls; provided there was no undue disparity between the controls and the alloy under test, the period of time required to attain the particular temperature was immaterial as it depends on a variety of circumstances, such as different modes of packing, which are common to all. The first series of tests was made in a standard laboratory autoclave with the escape open and a 99° C. alloy. The process was controlled by a maximum thermometer and a *tube témoine* containing powdered exalgin and an aniline dye which fuse together at 99° C. The results were erratic: sometimes one, sometimes another of the three indicators showing a positive result, but rarely all three together. This demonstrated in a striking fashion the well-established but by no means generally known fallacy attending the use of an "upward displacement" sterilizer or disinfector—the almost incredible effects of "lag" due to the insulating properties of air-pockets and other causes leading to unequal distribution of heat within the chamber, even when the indicators are within a few inches of one another.

The second series of tests was made with a Lelean's sack disinfector packed with Army blankets with the device and controls grouped together in the middle of the sack. As a third control a carefully tested thermo-couple and milli-voltmeter was employed as well as a resistance pyrometer. Lelean's sack, as is well known, acts by downward displacement, the current of steam entering at the upper end of the sack. In these circumstances more regular results might be anticipated and were in fact realized in a remarkable degree.

The following is an illustrative test:—

(Alloy 99° C.) Lelean's sack packed with army blankets. Device, controlled with exalgin tube, maximum thermometer and thermo-couple placed in middle of sack. Steam admitted. At twenty-eight minutes thermo-couple registers 100° C. At thirty minutes bell rings. Sack is now emptied and remaining indicators examined. Exalgin tube found melted and thermometer registers 212° F.

The third series (actually carried out some three years previously in Simla) was with a very large high-pressure disinfector working at twenty pounds to the square inch. The device answered perfectly, and afforded the writer a considerable sense of security in dealing with a sharp outbreak of typhus and another of small-pox. In large machines or indeed in any machine where a permanent fitting is desired, one lead is insulated and conducted to the interior through the medium of a sparking-plug inserted into the shell of the disinfector, the other lead being earthed to the metal shell.

Another series of tests was concerned with the selection of the most suitable alloys, by means of the determination of their plastic point. This was done by the simple method of immersing the device, with a rod of the alloy under test in position, in water (with or without glycerine to raise the boiling point), heating the water and observing the temperature at which the rod became plastic, sheared through, and released the spring.

Experience shows that it is better to obtain the rods ready-made from the manufacturers, rather than to cast them oneself from a larger mass of metal, as repeated melting tends to affect the homogeneity of the alloy, unless great care is taken in mixing. Subject to this reservation, repeated tests showed remarkably little variation in different samples of a particular alloy—not more than one or two degrees, which is negligible in dealing with a range rather than a critical temperature.

Practical Points in the Application of the Device.—The indicator is so constructed that a shearing stress, equivalent to about 700 grammes weight, is brought to bear at two points on a rod of alloy, five-eighths inch long and one-eighth inch thick, by the action of a helical spring in a state of compression, and its mode of action is apparent in the diagram. The strength of the spring should, of course, be approximately the same in each apparatus. It is important that the relation between the plunger-spring and the springs of the nipples should be such that the latter are both slightly depressed when the plunger falls. This is necessary to ensure good electrical contact. The leads are made of ordinary electric-light "flex," and may be conducted into the sterilizer between the cover and the body, preferably between two thin pieces of rubber sheet, the woven covering of the wire being removed at that portion. This makes a steam-tight joint, but for a permanent arrangement the sparking-plug referred to above is neater and less liable to derangement. As the device depends on the establishment of an electrical contact, it requires reasonable care regarding the integrity of the leads and the cleanliness of its contacts, and this should be tested in every instance by allowing the plunger to fall and make contact before finally placing the rod in position. The indicator itself is almost indestructible, but the "flex" will require replacement occasionally.

Conclusion.—The writer is of opinion that this device affords, at a small cost, a reliable means of controlling all processes of sterilization and disinfection in which heat is employed, and gives definite information, hitherto unobtainable except under experimental conditions, relating to the time-factor involved in those processes. In bulk disinfection it gives security, saves time, and prevents unnecessary consumption of fuel.

The indicator can be obtained from Messrs. C. F. Casella and Co., Ltd., Parliament Street, S.W. 1, and the rods of fusible alloy from Messrs. Johnson, Matthey and Co., Ltd., Hatton Garden, E.C. The alloys which this firm have made for the writer have plastic points of 83°, 99°, and 113° C.

Acknowledgments.—The writer is greatly indebted to Lieutenant-Colonel W. W. Browne, O.B.E., R.A.M.C., for his kindness in placing at the writer's disposal valuable experimental facilities at the Army School of Hygiene, Aldershot, and to Major C. H. H. Harold, R.A.M.C., whose advice and assistance were of great value.

REFERENCES.

[1] Black, Kenneth. "A Weak Point in Sterilizing Methods," *British Medical Journal*, January 31, 1925.

[2] Hall, R. J. B., Chapman, A. W., and Phillips, Miles. "A Study of the Efficiency of Sterilization of Dressings," *British Medical Journal*, June 20, 1925.

[3] Hallilay, H. "Asepsis," *Indian Medical Gazette*, October, 1925.

NOTES ON REGIMENTAL MESSING ARRANGEMENTS.

By Captain and Quartermaster G. A. COLLIER.
Royal Army Medical Corps.

(*Continued from page* 291.)

Cooking.

Regulations for Medical Services of the Army, para. 391, provide for periodical inspection of food and cooking by a medical officer.

According to King's Regulations R.A.F., para., 1173, it is the duty of the C.O. to see that the airmen's meals are properly provided.

A well-trained and keen cook is the solution to most of the messing difficulties. Men selected for cooks should be interested in the work. They should be medically examined before being employed. They may receive extra pay from the cash obtained by the sale of by-products, provided they carry out their duties efficiently (A.C.I. 234 of 1925), 6d. per diem when 7s. per week is received for every 100 men; 3d. per diem when 5s. is received for every 100 men. K.R., R.A.F. 1730 (4).

The dripping used in lieu of margarine is to be charged to the messing and credited to the by-product account. A.C.I. 340 of 1921.

The senior regimental cook should have been trained at the cookery school and be capable of teaching his art to the company cooks. He should be able to maintain discipline in the kitchen, and by constant example and supervision instil the habits of personal cleanliness into his men. Cooks should never be permitted to enter the kitchen before having washed, shaved and carefully cleaned their hands and finger nails. They must be dressed in suitable clean clothing.

The Manual of Military Cooking gives further details of the sergeant cook's duties.

Since food must be clean, a sufficient number of suitable utensils should be supplied, and material to keep them clean, including nail brushes and soap for the men's hands.

Air Publication 112, App. "D" orders the provision of nail brushes, soap and towels for use in every kitchen.

Copper cooking vessels must not be used when any portion of the inside tinning has worn off.

Kitchen.

The kitchen and cooking apparatus are to be inspected daily by an orderly officer who will visit the dining rooms during the breakfast, dinner and evening meal hours to see that the meals are properly prepared and that there is no cause for complaint. King's Regulations, para. 1485; King's Regulations, R.A.F., para. 1175.

The C.O. will frequently visit the kitchen to see that the food is properly cooked. King's Regulations, R.A.F., para. 1722 (3).

Anti-fly measures include the provision of 10 fly-traps for every 100 men annually, 3 ounces of castor oil and 6 ounces of rosin for every 100 men monthly; 10 fly-papers for every 100 men weekly; and the exhibition of fly-posters. A.C.I. 360 of 1923,

Tanglefoot is prepared by boiling in a glue-pot, nine and a half parts rosin, and five parts of castor oil. The formula for fly-killing solution is: formaldehyde 40 per cent., 2 tablespoonfuls; sugar, 1 dessertspoonful; lime water, filtered, ½ pint; water, to 1 pint.

Stock-pot. The bones are boiled in a net. The pot is to be cleaned out every third day in winter and daily in summer. Instructions for the use and care of the stock-pot which forms part of the Richmond cooking apparatus are given on page 16 of the Manual of Military Cookery and Dietary.

The drawers in cupboards and tables are not to be used as receptacles for dirty clothing, etc. Washing, shaving, and other cleaning kit should be kept in the barrack-room. Smoking should be prohibited during the actual preparation of the food, as cigarette ash and cigarette ends are liable to fall into the material.

For cooking, three pounds of fuel per man per week is allowed for Warren's cooking apparatus, and five pounds per man per week for all other forms of cooking apparatus in barrack cook houses (Allowance Regulations).

Royal Air Force.

Hints on fly prevention and destruction are found in Air Force Publication 112, paras. 136 to 140, and App. "J."

The Dining-Rooms.

The dining-rooms should be well lighted and warmed. A scale of fuel has recently been authorized.

The tables and utensils should be scrupulously clean for each sitting.

Usually six but sometimes eight men are seated at each table. A list of the names of the men dining at a table should be placed on or near it to avoid confusion.

According to the Royal Air Force K.R., enlisted boys are to have a separate mess from the airmen.

Two plates are to be provided for each man, and these are supplied by the officer-in-charge barracks and kept up at the expense of the unit, less the annual 15 per cent of the cost allowed for breakages.

A plentiful supply of hot water, good swabs and round towels should be provided for washing-up purposes, and the provision of a suitable washing-up place, with sinks, drainage boards and plate racks, is essential.

The men chosen for waiters should be medically examined.

They should be trained, given written instructions and ordered to wear suitable clothing.

Food is to be carefully served; the plates must be heated either by placing in an oven or a hot-water bath.

Food should not be issued to tired men; arrangements should be made so that the men have time to rest before and after the meal.

One pint of beer per man may be consumed in the dining-room at dinner. K.R., para. 518.

The meal should be hot when issued and in such quantities as will allow of a second helping. Any food remaining should be re-issued and consumed later instead of being thrown into the refuse tubs.

From funds obtained by the sale of by-products the following extra utensils should be purchased:—

	Army	R.A.F.
Each dining table—		
Table-cloth	—	1
Water-bottle (carafe) ..	1	1
Bread-basket	1	1
Mustard-pot	1	1
Salt-cellar	1	1
Pepper-box	1	1
For each serving table—		
Serving ladle	1	1
Serving fork	1	—
Dishes for meat	1	1
Dishes for vegetables .	1	1
Dishes for pudding ..	1	1
Carving knife	—	1
Carving fork	—	1

The articles may not be bought with saving from the "cash" or "commuted cash" allowances.

APPENDIX 1.

The Travelling Kitchen. Mark I.

The travelling kitchen is described in the List of Changes of War Material, No. 16035, dated August 1, 1912; it consists of a limber and body, and is designed to cook for 250 men, and to carry rations, fuel, spare parts and equipment stores.

The body and limber are to be kept horizontal when in use.

On the top of the limber are four boiler compartments, lined with asbestos fibre, each containing a boiler. Behind are carried jam, sugar, salt and tea, in four boxes, beneath which there are two compartments for cook's implements; on the under side of the limber are two other compartments for spare parts. Four frying pans, two on either side, are strapped on to the limber.

The limber may be used separately for distribution of food. There are spare draught poles carried in the loads of an infantry battalion which can be used for this purpose.

The body has seven open compartments, viz., five for boilers and two for fuel.

A fire-box is placed behind and a perch pole in front.

Five boilers are carried on the body, 1 with a tap for hot water, and 4 for food. Each boiler has a capacity of 6½ gallons and is provided with an anti-splash inner-lid and a cover. The fuel boxes hold one cwt. of coal fuel.

A jointed bearer is carried on the near side of the body. It is used for lifting the boilers from the body into the boiler compartments of the limber. The contents of the boilers being at a high temperature are thus kept hot for a period of four to six hours.

The body is supported by a wood prop under the front, and a steel prop under the rear. It is fitted with removable perch by which it is attached to the limber. The perch is replaced by a No. 9 pole when travelling separately.

Dimensions when limbered up, length overall is 22 feet 8 inches, and the track 5 feet 4 inches.

Weight empty, 17 hundredweights, 1 quarter, 14 pounds; filled[1] 24 hundredweights.

Four horses pull the load.

The following alterations have been made to the original design :—

Ovens have been placed on either side of the perch socket, and a central oven fitted in the smoke box, directly under the chimney containing oven shelf and two small baking trays. See List of Changes of War Material, No. 21,286, dated November, 1918, by local modifications, and Lists of Changes of War Material, No. 21,287, dated November, 1918, modifications made when passing through the factories.

A description of the travelling kitchen is given in the Manual of Military Cooking and Dietary, 1924, Schedule "K," page 77, and the method of using it and the preparing of meals on pages 80 and 81.

The use of the travelling kitchen is restricted to brigade training, divisional training and manœuvres. (Equipment Regulations, Part 1, 1923, amendments dated August, 1924, para. 144.)

Each field ambulance is provided with a travelling kitchen.

The following instructions regarding the care and preservation of travelling field kitchens have been published :—

Cookers should, as far as possible, be kept under cover, or rough shelter provided.

Boilers containing food or water should be carefully lifted out and in by the pole provided for that purpose, and not by a man standing on the cooker.

Boilers should at all times be carefully handled, and not thrown carelessly about.

The greatest care should also be taken to see that boilers are not put back empty, with a fire in the cooker.

Emery cloth or bath brick, or any cutting substance, is on no account to be used in the cleaning of the boilers. All that is necessary is a thorough cleaning, after each meal, with hot water and soda, and careful drying with a dry dish-cloth.

Once the contents of the boilers have been brought to boiling point,

---

[1] Includes 87 pounds of rations in cases, and 1 hundredweight of fuel. The tonnage for shipment is 8·244 tons.

very little fire is necessary to maintain the heat required. Too much fuel is invariably used, and violent stoking is totally unnecessary.

The greatest care should be taken to fix the prop under the perch and the iron stay under the back part of the cooker before detaching it from the front part. Neglect to do this causes the back part to tip up.

On no account is unauthorized kit or other impedimenta to be carried on the cooker.

Drivers should be careful not to take their cookers over rough ground if it can be possibly avoided.

Cookers should not be used in standing camps, or where it is possible to construct field kitchens.

APPENDIX 2.

Field Cookery.

(1) The portable stove for field medical units was introduced in August, 1896, to cook for fifty patients. It consists of two ovens of steel plate, two boilers, four baking dishes, a grate for coal fuel. It weighs 90½ pounds and can be carried on pack transport. It is described in R.A.M.C. Training 1925, paragraph 114.

(2) Soyer's stove, to cook for sixty men. Designed by the French chef, Soyer, during the Crimean War. It consists of a body with a firepot holding a removable boiler, capacity 12 gallons. The allowance of coal fuel is 1 pound per man per diem. This stove has been included in the field ambulance equipment.

(3) Field kitchen, designed to cook for 105 persons. This trench kitchen is described in paragraph 112, R.A.M.C. Training, 1925. A sloping trench, 9 feet in length with 2-feet turf chimney, over which seven oval, 3-gallon camp kettles are placed in a covering of puddled clay or turf. Wood fuel is required at the rate of 2 pounds per man per diem.

A modification of this form of field kitchen is described in the Army Manual of Sanitation, p. 54, fig. 22.

(4) Aldershot oven. Designed to hold fifty-four 2-pound loaves. Its component parts are: 2 segments, 2 ends, 4 bearing bars, 1 bottom plate, 9 baking dishes, 1 peel. Weight, 374 pounds. Fuel, 300 pounds wood on first day, 150 pounds on second day. Time for baking bread, one to one and a half hours. See page 73, Manual of Military Cooking and Dietary. Will cook dinners of meat and potatoes for about 220 men.

(5) Improvised field kitchen (3rd Army). Designed to cook for 90 men. It is built with rectangular tins filled with earth. There is a corrugated iron firebox, length 5 feet 8 inches, 6 oval camp kettles are fixed in puddled clay. Wood fuel is used.

(6) Improvised field oven. Designed to cook for 60 men. There are 3 improvised ovens built in brickwork—2 below for roasting, and 1 above for warming. Wood or coal fuel may be used.

(7) Improvised field kitchen, for roasting and boiling. Designed to cook for 85 men. There are 5 oval camp kettles placed above 5 ovens

made from 5-gallon cresol drums. Built in brickwork. Length 7 feet, height 3 feet. Wood fuel is used.

(8) Modification of No. 3, to burn oil fuel and cook for 60 men. The apparatus, built in brick, having two angle-irons for fuel channels, two 5-gallon drums (one for oil and one for water), and a tray to collect the unburnt fluid. The four oval camp kettles are placed above the firebox; an iron plate is added to cook chupatties. Length 7 feet, height 1 foot 6 inches. Requires about 200 bricks.

APPENDIX 3.

METHOD OF USING PEAS, LENTILS, BEANS OR OTHER PULSES (DHALL) FOR THE PREVENTION OF SCURVY, IN THE ABSENCE OF FRESH VEGETABLES.[1]

(1) The dry seeds must be whole, retaining the original seed-coat, not milled or decorticated.

(2) They must be soaked in water for several hours; the time necessary depends on the temperature, twenty-four hours at 50° F. to 60° F., and twelve hours or less at 90° F.

(3) The water must then be drained away, and the peas, beans, etc., allowed to remain in the moist condition with access of air. They will then germinate and the small rootlet grow out. This germination will take forty-eight hours at 50° F. to 60° F., and twelve to twenty-four hours at 90° F.

(4) The operations described in (2) and (3) could conveniently be done under active service conditions in such manner as the following:—

Soaking.—The peas, beans or other pulses, placed in *clean* sack, should be steeped in a trough, barrel or other suitable vessel, full of clean water, and should be occasionally stirred. The sack and trough, etc., should be large enough to allow for the swelling of the peas to about three times their original size. In a hot climate six to twelve hours should suffice for this soaking.

Germination.—The peas should be lifted out of the water and spread out to a depth not *exceeding two to three inches* in a trough or other vessel with sides and bottom porous or well perforated with holes. This is to allow complete access of air. *The seeds must be kept in a moist atmosphere.* This is done by covering with damp cloth or sacking, which is sprinkled (by hand or automatically) as often as is required to keep the peas or beans thoroughly moist underneath. The germination should reach the stage mentioned in (3) above within twenty-four hours in a hot climate.

All the vessels should be clean.

(5) It is important that the germinated pulses should be cooked and eaten as soon as possible after germination, and should not be allowed to become dry again, as in that case the anti-scorbutic properties, acquired during the process of germination, will again be destroyed. The pulses should not be cooked longer than necessary, and in no case for a longer period than fifteen minutes.

---

[1] See Army Manual of Sanitation, 1926, Appendix X.

A CORRESPONDENCE CIRCLE.

XIII.

NOTES ON A FEW CORPS TOPICS.

By Brevet Colonel W. R. P. GOODWIN, D.S.O.

(1) *Out-patient Record Cards—vide* Ritchie in JOURNAL OF THE ROYAL ARMY MEDICAL CORPS for November, 1925.

I entirely agree as to the utility of these records.

Cards, very much as described, for soldiers treated in barracks have been in use at the Military Hospital, Gibraltar, since the beginning of the present year, and have proved invaluable. They are particularly useful in the case of proposed invalids, men coming up for extension of service, etc. It is important that the cards be sent to the new station when soldiers are transferred.

(2) *Liaison between Stations regarding Soldiers transferred as Sick or Invalids.*

It is suggested that there is need for closer liaison between Military Hospitals regarding the progress of sick or invalids transferred from one station to another, especially in the case of men invalided from abroad. It happens not infrequently that men are invalided from stations abroad, for disabilities of outstanding interest, and the medical authorities at the foreign station hear nothing more of the later progress of the case unless they write and ask, and as it is not always known to what hospital the patient has gone, this is not always easy. It is suggested that the home hospital should send the foreign station hospital fortnightly or monthly reports (according to the interest of the case), until such time as the case passes out of the interesting stage.

(3) *Corps Colours for Games.*

So far as I know there is no definite rule laid down as to what colours officers and men representing the Corps in football and other matches should wear. The different companies appear to vary considerably. It is suggested that definite colours be laid down for football shirts, etc., and that all companies adopt them.

Again, there is the question of blazers—there appears to be no universal pattern of blazers for officers of the Corps to wear at cricket, etc. One sees plain blue blazers, with or without the Corps badge on the pocket, blazers with Corps buttons, and so on. Might we not have one standard pattern blazer?

(4) *Distinguishing mark to be worn by all ranks of the Corps on Service Dress Helmets.*

It is suggested that the Corps serving abroad wear a distinguishing mark on the helmet at all foreign stations. I believe nothing is laid down. At Gibraltar we are the only unit which wears no distinguishing mark; I believe officers and men serving in Egypt wear something of the kind.

Note.—Colonel Goodwin's suggestions will be welcomed by officers of the Corps, as they deal with matters that concern us. As regards the Out-patient Record Cards, this was the suggestion of a correspondent, and I regret that it should have been incorrectly attributed to me. Blazers are now worn so universally that a standard pattern for the Corps would be appreciated. One might suggest something quiet, yet distinctive—not necessarily a laurel wreath on the pocket, but perhaps a crown, or our alternative device of the lion and crown, as on the full-dress waist-belt. Fashions in semi-regimental garments and haberdashery change frequently, and it is suggested that there might be some standing committee of one of the Corps institutions to decree changes. All these matters, apparently trivial, have an accumulatlve effect on Corps *moral*, and anyone interested in the art, or gift, of leadership will not fail to discern their value. Another matter that might receive consideration is the institution of a Corps "Day." We want one day in the year that we can look on as our own, when we can celebrate our festivities, have sports or play matches, send greetings to our distant comrades, and hold our gatherings. The R.A.M.C. Association could help here, as it concerns our former comrades as much as those now serving.

M. B. H. Ritchie.

Note.—Corps colours have been authorized, and blazer, cap, scarf and tie can be obtained from Messrs. Drew & Co., 27, St. James' Street, S.W.1.

The day of the Corps Dinner is a Corps Day, and it is hoped that officers will display their appreciation of it by giving increased support to the meetings held on that day.

The Corps Golf Meeting follows the Corps Day, and with a little enthusiasm it should be possible to arrange for a Corps Cricket Match at the same time. [Editor.]

Editorial.

THE MEDICAL UNITS OF THE OFFICERS' TRAINING CORPS.

It is now nearly eighteen years since this organization was launched, and its condition to-day (of the morrow it would be rash to prophesy in these days of retrenchment and change) shows it to possess vitality.[1] To those who are not acquainted with the aims and work of the organization, some account of it may be of interest. Of its importance there can be no question. When we look at the depleted condition of the R.A.M.C. Militia and the Supplementary Reserve, we wonder from what source a *trained* reserve of young medical officers can be drawn to meet a national emergency. At the present time there is a dearth of young officers in the Royal Army Medical Corps. The officers of the Territorial Army (R.A.M.C.) will be required for their own units, and the number of these units has been cut down. The Medical Units of the Officers' Training Corps would seem to supply the solution of this problem; and we think that anyone who has the patience to read what follows will be satisfied that these units will provide as efficient material as could be desired.

It will be remembered that the Officers' Training Corps was formed in 1908, its object being primarily to provide students at schools (junior division), and Universities (senior division), with a standardized measure of elementary military training, with a view to their applying eventually for commissions in the Militia, Territorial Army or Regular Army Reserve of Officers, and secondarily *to provide a potential reserve of young officers to meet a national emergency.*

Providentially a sufficient number of young officers had been trained prior to the outbreak of war in the O.T.C. Units (medical as well as other) to save the situation during the first two years of the Great War.

The Medical Units alone supplied some 2,000 young officers, a considerable number of whom had been granted commissions in the Special Reserve of Officers R.A.M.C. and Territorial Force on completing their O.T.C. training, in pre-war years. The record of service of these officers is a very fine one, and the value of the training they received in the O.T.C. was acknowledged both by the officers under whom they served, and by themselves.

[1] In the Annual Report for 1925 of the Officers' Training Corps it is shown that out of the whole body of the Senior Division, Officers' Training Corps, numbering 4,254 in strength, cavalry, artillery, survey company, sound ranging, engineers, signal service, infantry, medical and veterinary units, the medical units form eighteen per cent of the strength, and in point of percentages of "efficients," camp attendance, and examination results for certificates they equal the remainder of the units.

The organization of the Senior Division O.T.C., of which the medical units constitute a technical branch, is as follows :—

In a University providing an O.T.C. contingent a military education committee is formed, which is charged with the internal administration of its contingent, and is responsible to the University therefor.

The contingent may comprise units of each arm—cavalry, artillery, engineers, infantry, and where there is a medical school (as the personnel of the medical units consists exclusively of medical men and students), medical units.

The officers of units are commissioned as a rule in the Territorial Army.

The members of the rank and file, designated "officer cadets," are students of the university, and serve under a contract with their University. They are not subject to Military Law.

There is a commanding officer of the contingent, frequently a retired combatant officer, and an adjutant who is an officer of the Regular Army, and is attached to the General Staff.

Non-commissioned officer instructors are appointed from the Regular Army.

Arms, equipment and ordnance stores are supplied from Army sources.

The training is devised and supervised by the General Staff at the War Office (for the purposes of the medical units a medical officer was attached to the General Staff at the War Office).

The training unit of the medical units is a company of a field ambulance (there may be more than one at a University), and its instructional material is held on charge at the University centre.

The training is carried out by the officers of the unit assisted by the attached N.C.O. instructors, and the N.C.O. of the unit, during term time in the University centre, and in annual camp during the vacation. Examinations for Certificates A and B, which are warrants of proficiency in the subjects taught in the first and second periods of training, are held half-yearly.

As will be seen from the Subjects of the Examinations quoted later, the training of the medical cadet aims at fitting him to perform the duties of a medical officer in charge of a battalion or other unit on field service, or those of an officer of a field ambulance. It is designed to familiarize him with conditions of service in the field, and is made as practical as possible.

The period of training is from a minimum of two to four years, divided into two periods as for Certificates A and B respectively.

The subjects taught during the first period do not involve knowledge of medicine and surgery, as the medical cadet has not yet entered upon their study. Some knowledge of medicine and surgery is required for the assimilation of the teaching during the second period of training, which includes such subjects as hygiene and the preparation of casualties for evacuation.

In the event of general mobilization and compulsory service, as during the late war, cadets of the first category, i.e., up to the end of their second year of medical studies, would be treated as laymen, and held to serve with the colours. Those of the second category, i.e., after their third year of professional education, would continue their studies with a view to qualifying and taking commissions in a medical service, and complete their training in their Medical Unit O.T.C.

The nature and scope of the training will be best judged by reference to the syllabus of examinations for Certificates A and B which follow.

SYLLABUS FOR CERTICATE A, MEDICAL.

PART I.—*Practical examination.*

Squad drill.

Handseat, stretcher, ambulance wagon drill and shoulder-carrying stretcher drill.

Bandages and bandaging, application of improvised splints, tourniquets, and field dressings, Thomas' splint drill.

Map reading. Candidates must know how to read a map sufficiently to be able to answer the tactical questions on the ground or indoors.

The candidate should have a knowledge of the practical use of the compass by day and by night, how to take a bearing off a map, and how to find his position on a map by resection. This necessarily includes the use of a protractor and a knowledge of magnetic variation, upon which points questions may be asked.

PART II.—*Written examination.*

Tactics, general. The object of this paper is to test whether the candidate has such a knowledge of the action of other arms and departments as would be necessary for the efficient performance of his duties as a medical officer attached to a unit in the field.

He should have a knowledge of :—

Intercommunication, orders, instructions and reports in the field.

Simple tactical problems such as might confront a medical officer attached to a unit in the field.

Map reading and the use of the compass.

Outlines of schemes for collection and evacuation of casualties and the transport of wounded.

Tactics special to arm. General characteristics of injuries in war, including gas warfare.

Prevention of Disease. A general knowledge of the kinds of disease common among armies in the field, the means by which they are spread and the methods adopted for their prevention. A knowledge of field sanitation, including the construction of camp sanitary appliances.

Quarters, billets, camps, bivouacs, and field cooking.

Provisions of the Geneva Convention.
Marches and movements by rail, and march discipline.

Syllabus for Certificate B.

Part I.—*Practical.*

Drill. The candidate will be required to drill a platoon in simple movements in close order.

Tactical. A simple tactical scheme on the ground, without troops. Problems will be limited to those which might confront a regimental medical officer, or a field ambulance officer.

The candidate, however, should thoroughly understand what the positions would be of other medical units in relation to his own for the purpose of evacuation of casualties.

Questions may be asked on map reading and the reconnaissance of roads, railways and buildings in so far as they affect the medical services, on the laws and usages of war, on march discipline, the lay-out of camps with their sanitation, on the issuing of orders, and reports in the field.

Part II.—*Written Examination.*

Tactical, General. This paper will be based on a simple tactical problem involving the tactics of all arms in so far as they would affect the duties of a field ambulance or other unit in the field in connexion with evacuation of casualties, and the health of troops.

The candidate should also be familiar with the use of the compass, map reading (in the paper a map is used), the laws and customs of war, the issuing of orders and reports in the field.

Military Hygiene. Such questions on hygiene and sanitation as might confront a medical officer on service with a unit in the field.

His duties in connexion with food, water, clothing, shelter, prevention of disease, disinfection, sanitary inspection and constructional work.

He should be familiar with the arrangements to be made for the welfare, recreation and comfort of troops when off duty.

He will also be expected to have a general working knowledge of the sanitary organization of an army in the field.

Organization and administration. Involves a general knowledge of the medical services in the field, for the disposal and recording of casualties and their transport, the replenishment of stores, equipment and personnel, and the restoration of the health and morale of battle-tired troops. He should have some knowledge of the internal economy of all field medical units.

Instruction in these subjects is given by means of lectures, and wherever possible by practical demonstrations; minor tactical exercises are held, and the equipment of the unit is thoroughly studied.

The cadet has to attend a fixed number of parades to become efficient.

At the annual camp, attendance at which is also obligatory for a certain number of days, the unit eqipment and transport are mobilized and completed to scale by the command, and progressive exercises are carried out with the various parts of the field ambulance, in combination with regimental medical personnel and medical equipment found by the unit, regimental aid posts, advanced and main dressing stations are formed, and casualties are handled according to plan. Field cooking is practised ; camp sanitary appliances are constructed, water purification and march discipline, compass work by day and night and all the other subjects which can be translated into practice are brought into the daily schemes of work.

It is usual for the medical unit to take part in a combined practical scheme of all arms at each camp, or a medical tactical scheme on a large scale without troops may be worked out on the ground with the assistance of cycles and cars, and reconnaissance of roads, railway stations, buildings, etc., likely to be used in the evacuation and concentration of casualties is included in the operations.

Practically all the officers at the present time and also a proportion of the cadets (these are at the moment of writing disappearing) of the medical units have had war experience, so that the instruction given is on a high plane, and much keenness is shown in the work.

Though it is not compulsory upon cadets to take Certificates A and B, it is of great importance to their contingent that they should do so, as they thereby earn a grant to the contingent; and the certificates are valuable also to the cadets individually in the event of their taking commissions, as they obtain a credit of marks at the entrance examination for the Regular Medical Services, and seniority in the Territorial Army, and they are also exempted from preliminary training in the Supplementary Reserve of Officers.

Medical units have been formed in the following Universities :—

Edinburgh, in August, 1908, the then existing Volunteer R.A.M.C. transferring to the O.T.C.

Cambridge on November 20, 1908.

Oxford on November 30, 1908—this unit has been in abeyance since December, 1922.

London in January, 1909.

Belfast on April 1, 1910.

Dublin University on April 4, 1910, disbanded on creation of the Irish Free State.

Royal College of Surgeons, Dublin, on April 25, 1910, and additional February 10, 1911. Converted to two corps of infantry on June 28, 1913. Medical unit revived in 1919. Disbanded on creation of the Irish Free State.

Aberdeen University in 1912.

Glasgow University in 1919 (before the war many medical students joined a local T.F. R.A.M.C. unit)

Durham University on February 11, 1925.

The numerical strength of the various units has fluctuated from time to time, and was reduced to the lowest dimensions at the end of the war; but under the enthusiastic and untiring efforts of their commanding officers, a notable revival has taken place, and at the present time there are 817 cadets in training. Moreover a larger proportion of cadets are now taking Certificates A and B than was the case in the early history of the formation. In 1925 seventy-five Certificates A and twenty-nine Certificates B were obtained.

The officers of the Medical Units O.T.C. are in many cases teachers at the University, in others practitioners in touch therewith. They are all busy men in their various vocations and all sacrifice much of their time and their holidays in the interests of their units.

The commanding and senior officers have had practical experience of actual warfare, which is of inestimable value in the training and instruction of their commands.

The cadets, as might be surmised of men who voluntarily give up their leisure to prepare themselves for the service of their country, are the pick of the students in point of morale, and number among them many of the athletes of their Universities.

The R.A.M.C. has among its officers a good many who underwent training as cadets in the Medical Units of the O.T.C., and when the future of the R.A.M.C. is more settled there is little doubt that the Medical Units O.T.C. will be the chief and best recruiting ground for officers R.A.M.C.

Too much credit cannot be given to the officers of the Medical Units, past and present, for their patriotic and self-denying work done at the expense of their scanty spare time and holidays, without tangible reward : and their activities are not confined to the actual training of their units, for they keep themselves up to date by undergoing courses of instruction in Army Medical Establishments.

In the Universities themselves, the organization is of value, as inculcating loyalty and discipline, and also forming a healthy social circle.

Its value to the country may be judged by what has already been said, and the organisation should be given every encouragement and support.

Clinical and other Notes.

TWO CASES OF PURPURA VARIOLOSA.

By Major ROBERT PRIEST.
Royal Army Medical Corps.

This dreadful malady being one of the types of hæmorrhagic small-pox, is occasionally more frequent in some epidemics than others.

In an outbreak of small-pox, sporadic in character, at Meerut, during December, 1925, and January, 1926, out of a total of seven cases amongst Europeans, two were of this hæmorrhagic type. In both cases the march of progress showed definite stages, and both cases terminated fatally.

In the final stage the patients presented a frightful appearance. The skin became plum-coloured, the face swollen, conjunctival hæmorrhages were so large that the corneæ appeared sunken, giving a ghastly appearance. The mind in one case was clear to the end. Below I append a brief description of these patients. Personally, I had never seen this type of small-pox before, and by publishing these cases I hope I shall assist other medical officers to realize early that it is small-pox, and to take the necessary precautions.

Case 1.—Mrs. K., aged 42, vaccinated in infancy, but had since refused all offers of revaccination, even as recently as July, 1925.

December 18: Felt quite well.

December 19, first day: Complained of headache and slight pain in the back.

December 20, second day: Noticed redness of skin in axillæ and some redness in the groins; pain in back worse.

December 21, third day: Erythema more marked and showed a tendency to spread on to the chest, back and front, and on to the thighs, abdomen and buttocks; backache severe; no vomiting.

December 22, fourth day: Superimposed upon the erythema were darker red petechiæ, and over the rest of the body the erythema had spread. A few purpuric areas were noted on the outer side of the thighs and on the posterior axillary folds. Throat clear, tongue slightly furred, lumbar pain intensely severe. Some metrorrhagia. Slight hæmorrhage into conjunctivæ. Admitted to hospital.

December 23, fifth day: The regions of axillæ and "bathing-drawers area" had become purpuric and plum-coloured; eyes swollen, conjunctivæ filled with blood, and the corneæ lay below the level of the conjunctivæ. The rest of the body was covered with intense and dark red erythema; purpuric areas and petechiæ were seen in the flexures of elbows and knees; purpuric patches appeared on the buccal mucous membrane and on the right tonsil. Patient now lethargic and almost free from pain. Sites of hypo-

dermic injection showed extensive ecchymosis. Metrorrhagia still present. Succumbed very rapidly at 1.30 p.m., and her mind was clear to the end. With the exception of the very intense lumbar pain, there were no other severe constitutional signs and no vomiting throughout. No small-pox papules became evident.

Case 2.—Corporal W., aged 25, vaccinated successfully in infancy; all revaccinations had failed; vaccinated again on January 4, 1926, which was successful.

January 9: Felt out of sorts, thought this was due to vaccination, and did not report sick.

Marched with his battalion on 10th and 11th, and reported sick on 12th, complaining of a cold in the head and pain in the back.

January 12, fourth day: Erythema was well marked in axillæ and over the "bathing-drawers area," which rapidly became confluent and generalized over the body.

January 13, fifth day: Petechiæ and hæmorrhagic spots appeared in the axillary and "bathing-drawers area," the generalized erythema becoming more blue and blotchy. Severe lumbar pain, intense headache and pain behind the eyes, which were now suffused. Vomiting a marked feature; restless; tongue furred; buccal mucous membrane acutely inflamed and dark red.

January 14, sixth day: Vomiting easier; cough troublesome. Hæmorrhages into the skin more profuse and the whole body assumed the colour of a ripe Victoria plum with darker purple areas in axillæ and groins, thighs, abdomen and buttocks. Hæmaturia and melæna present; subconjunctival hæmorrhage extensive; restless and confused.

January 15, seventh day: Purpura almost confluent all over body, and general appearance being the colour of a damson superimposed upon the lighter purple. The epidermis began to separate over the face and limbs, resembling the appearance seen after extensive scalding. From the superficial vessels thus exposed hæmorrhagic oozing occurred. Delirious; hæmaturia, melæna and bleeding from mouth and nose. A truly ghastly appearance. No definite small-pox vesicles appeared.

January 16, eighth day: Blistering appearance more marked on the flexor surface of arms, legs, and in joint crevices; very toxæmic; died 6 p.m.

The difference between the constitutional symptoms should be noted in the two cases. Further, the case with the less toxæmic signs proved more rapidly fatal than the one exhibiting a very severe type of toxæmia. Also it should be noted that the erythema was well marked between the third and fourth day in each case.

AN UNUSUAL CASE.

By Major M. WHITE, M.C.
Royal Army Medical Corps.

My excuse for publishing the following brief notes is that, in my experience, the case is distinctly novel.

Cases where men have swallowed buttons, safety-pins, lime, etc., are not uncommon, but hitherto I have not heard of dummy rifle cartridges finding their way into the stomach. Yet such is the story of Private H., 2nd Somerset Light Infantry, a somewhat unwilling soldier who reported sick at the British Station Hospital, Agra, on the evening of July 30, 1925, complaining of abdominal pain and said to have swallowed nineteen dummy ·303 cartridges.

Examination confirmed this seemingly impossible feat, as a sharp tap of the fingers over the stomach area produced a "click" clearly audible to the orderly standing at the foot of the bed.

After X-ray, gastrotomy was performed in the ordinary way, and eighteen cartridges removed, six being "bunched" near the pylorus, and the remainder in the cardiac portion; the last being apparently wrapped in a fold of the mucous membrane was rather intractable, and was removed only after the patient had been raised to the sitting posture. Efforts to find the nineteenth cartridge were unsuccessful, both wounds were closed, and recovery was uneventful. On the second morning following the operation the remaining cartridge was recovered from the stool, the man remarking, "I told you so."

From documents received since the operation I find that Private H. a short time previously had swallowed fifteen dummy cartridges while at another station, but in that case all were delivered per rectum.

Travel.

SECUNDERABAD—AN APPRECIATION FROM THE POINT OF VIEW OF AN R.A.M.C. OFFICER.

By Captain S. SMITH.
Royal Army Medical Corps.

Secunderabad.

The town and cantonment of Secunderabad, which hold one of the biggest garrisons in India, lie in the centre of the large native State of Hyderabad at a distance of about six miles from the famous city of the same name.

Hyderabad—a country of great natural wealth and with an area nearly as extensive as that of Great Britain—is situated on the great plateau of the Deccan.

It is the premier State of India, and its ruler, H.E.H. the Nizam, who

is accorded a salute of twenty-one guns, is reported to be one of the wealthiest monarchs in the world. His subjects are mostly Hindus, the language of the peasants being Telegu or Marathi, but he himself with most of the notabilities of the State is a strict Mohammedan.

A local currency is coined in the State mint, the standard coin being the oosmania-sicca (O.S.), more commonly called the halli-sicca (H.S.) rupee.

The exchange value of the oosmania currency varies, but the value of the O.S. rupee averages about two and a half annas less than that of the Indian Government rupee.

Formerly a handsome gold coin, the "gold mohur," was also coined in the Hyderabad Mint; these gold mohurs, although scarce and withdrawn from currency, can still be bought as mementoes.

Hyderabad has also its own post and telegraph system, the income from which forms part of the revenue of the State. Local stamps are used for letters circulating within the Nizam's dominions.

The country is almost entirely agricultural and, with the exception of Hyderabad (Deccan), its capital city, there are no large towns.

Wheat, rice and cotton are the staple products, whilst the important Singareni Collieries are amongst the most flourishing coal mines in India.

Hyderabad State is served by one of the few non-State-owned railways in India, the Nizam's Guaranteed State Railway, which has its workshops and officers' bungalows at Lalaguda, a small suburb of Secunderabad. The railway (broad gauge) traverses the Nizam's dominions from west to east, connecting up with the G.I.P. Railway on the western border of the State at Wadi and with the M.S.M. (Madras and Southern Marathi) at Beswada, a large but dirty village lying on the Kistna Canal on the eastern border, a total distance of nearly 300 miles.

In addition a metre-gauge line connects Secunderabad with the north via Manmad. This line, passing through the rich agricultural districts, is of ever-increasing importance.

The railway journey up from Bombay to Secunderabad, a comparatively short twenty-four hours' run, is quite comfortable, especially if one takes the precaution of booking a through carriage (at Victoria terminus, Bombay) in advance.

Secunderabad is a typical Indian cantonment town possessing broad, well-lighted streets, the inevitable maidan which acts as a parade ground and which is also used for polo and other sports, a very superior bazaar, and a number of English shops.

The general lie of the country is very flat with a gradual rise from Secunderabad (1,700 feet) up through Trimulgherry to Bolarum (1,900 feet).

Like most "plain" stations the country has a brown and dried-up appearance during the hot months, but becomes delightfully green during the monsoon and winter.

The soil is generally light and sandy with bare sandstone and granite rocks showing through in many places. These masses of sandstone and granite are constantly met with throughout the State of Hyderabad and constitute one of its most salient features.

Toddy and palmeyra trees abound, and the cantonment is surrounded by the ubiquitous (and incidentally mosquito-breeding) paddy fields.

Climate.—The monsoon breaks about June 17 and lasts until the middle of October. The four cool months of November, December, January, February, are delightful, comparable with an exceptionally fine English spring. There is practically no rain during these months beyond a few showers in January. Most of the social activities take place during the winter. From the beginning of March onwards the weather starts to

FIG. 1.—Typical Hyderabad scenery.

"stoke up," and April and May are very trying (the shade temperature often reaches 115° F.). Most of the ladies and children in the station migrate to the hills during the first week in April, but some of the older and more "knowing" residents leave about the middle of March.

The average rainfall is about thirty-three inches.

Garrison.—The Secunderabad Brigade (formerly part of the now defunct 9th Secunderabad Division) averages about 6,500 troops commanded by a G.O.C. with the local rank of Major-General; the Brigade offices are situated on high ground near the Residency at Bolarum.

The British garrison, with the exception of the Brigade staff and details (garrison police, etc.) at Bolarum and Secunderabad, is concentrated in the village of Trimulgherry, where also lies the finely-built and spacious British station hospital.

The two British infantry battalions are accommodated in roomy barracks in South Trimulgherry, one battalion occupying Gough Barracks

in the near vicinity of the hospital, while the other garrisons the fort, which, complete with its loopholed walls, moat and two drawbridges, the latter periodically raised, constitutes even to this day the official rallying place for Europeans in the event of a native rising.

North of the fort lie the artillery lines, where a brigade of artillery (minus one battery) is accommodated. The Artillery Mess is a fine building, with numerous trophies of the chase, including some fine heads hung round the walls of the ante-room and dining-room. The Mess also boasts a fine squash racquet court.

North of the artillery barracks are the Hyslop barracks, the home of a British cavalry regiment, situate officially in North Trimulgherry, but actually in Bolarum. In North Trimulgherry is also the British Section (V.D.) Hospital, formerly a very flourishing concern, but nowadays (luckily) half empty.

The native units are distributed between Bolarum, the home of two Indian cavalry regiments, Begumpett, Tarbund, Bowenpalli and Secunderabad.

The Mess of the 20-29th Lancers at Bolarum, formerly the old "Contingent Mess," is a fine spacious building, and boasts one of the best (certainly the best sprung) ballrooms in the station.

Amongst the native units must not be forgotten the two locally-raised and officered regiments of Imperial Service troops. These troops did yeoman service during the Great War, and are splendidly trained. They present a very picturesque appearance when drawn up for parade on the maidan.

Domestic.—Secunderabad is essentially, from the point of view of R.A.M.C. officers, a married man's station. Bungalows are cheap and moderately plentiful, furniture can be hired at a reasonable rate, servants are easy to procure, whilst the social life is what one likes to make of it and can be exceedingly gay.

Bungalows.—These are mostly Government owned, well kept up, and range in price from Rs. 40 to Rs. 80 per mensem. Several are, or were in my time, earmarked for R.A.M.C. officers, bungalows being provided for the O.C. hospital, second in command, for a major in the artillery lines, and for the O.C. Section Hospital. In addition there are two excellent and recently-built married captains' quarters (each about Rs. 60 per month). It is a wise precaution to give the O.C. hospital or other officer timely warning of one's arrival and requirements in order that a bungalow may be bespoke. In the event of no suitable quarters being available on one's arrival accommodation can be arranged at one or other of the two hotels, the Majestic or Montgomery's. Both of these have a moderate scale of charges, are under European management, and are quite up to the average of small Indian hotels.

Furniture can be hired in the town at prices ranging from Rs. 25 to Rs. 35 a month according to one's rank and bargaining powers.

Servants.—Good, bad and indifferent, are plentiful, and should be obtained locally. In my opinion it is a mistake to bring servants from other stations, or from Bombay; they usually cost more, and fight with one's local contingent. In a small establishment where no horse is kept the following servants are necessary: the butler, cook, ayah and dhoby being paid in Government coin, and the remainder in local H.S. currency. The monthly wages are bracketed against each:—

Butler (Rs. 30), ayah (Rs. 25), cook (Rs. 25), dressing boy (H.S. Rs. 18), chokra (H.S. Rs. 9), kitchen boy (H.S. Rs. 6), chowkidar (H.S. Rs. 10), sweeper (H.S. Rs. 9), mali (HS. Rs. 12), two coolies (each H.S. Rs. 6), dhoby (Rs. 16).

Total for servants Rs. 160 per mensem. In addition, if a motor be kept, a "cleaner" boy at H.S. Rs. 15-20 will be required.

Food is good and plentiful; meat, fish, vegetables and other bazaar products are cheap and of very fair quality. Recently imported English groceries can be obtained from many shops in the town (including Spencer's, a first-rate British shop, with headquarters at Madras), from the club, which lays in a large and varied assortment for its members, or from one or other of the regimental canteens; these latter, which for the most part are run by native contractors, supply many of one's wants in the shape of groceries, etc., at a considerably cheaper rate than the corresponding article can be bought in the town, partly for the reason that their goods are exempt from the 6 per cent. Nizam's tax, which all articles imported into the State (with the exception of those destined for the military) have to pay.

One's grocery bill depends very largely on the extent to which one can do without imported tinned and bottled goods, which are invariably expensive.

The choice of fruit is not great, but mangoes, melons, small oranges, pineapples, the latter rather "woody," but sweet and of excellent flavour, and bananas are plentiful and cheap when in season.

The variety of fish is limited, and consists largely of fresh-water fish, with the characteristic muddy flavour, caught in the local "tanks." Pomfret, a sea fish with a considerable reputation as a delicacy, and oysters are obtainable from Bombay and Madras.

Cost of Living.—If one lives and entertains moderately and keeps one's club bill within reasonable compass, it is quite possible for a married captain to live comfortably on his pay. A short statement showing the average monthly cost of living is given below. (For a married captain with one child and no European nurse.)

The following figures compare favourably with those given recently by "Married Captain" (JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, January 1925, p. 78), but he admitted that his estimate was based on the cost of living in an expensive seaport where prices are notoriously high.

Bungalow	Rs. 50
Furniture	„ 25
Servants	„ 160
Bread	„ 10
Dairy	„ 25
Bazar	„ 60
Groceries	„ 70
Wines, minerals, etc.	„ 70
Club	„ 80
Car	„ 60
Minimum	Rs. 610

For those not long established in double harness it may be a moot point to settle how much it is advisable to bring out with one from home, and what to buy on one's arrival in India. On this difficult subject, probably no two individuals think alike; it must be remembered, however, that most English goods (especially cutlery, silver, etc.) if bought in India have already paid a heavy import duty, which together with freightage charges raises the cost to almost double that of the home price; on the other hand officers proceeding home are often willing to sell their household goods at a very moderate rate, and during the winter weekly auctions are held where occasionally remarkable bargains can be made.

Table cutlery, linen, silver, cretonne chair-covers (about fifty yards) should certainly be brought out. (The customs' officials are very lenient over articles which accompany one.)

Dinner and tea services should be brought if one has them, otherwise if one is prepared to wait they can be bought locally.

A few well-made English suits and a good supply of afternoon and evening frocks, also a supply of hats (ladies'), are essential.

Boots and shoes are well and cheaply made locally, and only a minimum supply to act as models should accompany one. Drill uniform, topees, tropical suits, etc. (except a minimum for the voyage out), should most certainly be purchased locally.

Banks.—Neither Cox, Grindley, nor King, King and Company, have branches at Secunderabad, but there is a local branch of the Bank of India. Many officers bank with one or other of the local "shroffs," who are convenient and always open to make reasonable advances at the modest rate of 12 per cent per annum without further security than one's position as an officer—a not unimportant consideration when a car, etc., has to be bought.

Social Life.—The Club is, as in most Indian stations, the local hub of the universe. Although not a beautiful building (it was built I believe by a railway architect, and mightily resembles a railway station), it serves its purpose as a rallying point remarkably well, and is usually crowded from 5 p.m. onwards. The social life of the station is well catered for and there is a constant round of the usual entertainments, dances, etc., incidental to Indian military life.

Although primarily a Service club, there are many members to be found amongst the civilian community, the families of the railway officers being happily much *en évidence*.

There are also many Indian members from amongst the "Nawabs" in Hyderabad, and right glad are we to have them, for they are amongst the best liked and most sociable members of the club.

There is a limited number of residential bachelors' quarters in the club grounds, and a bachelor, if ordered to Secunderabad, should most certainly communicate with the Secretary, who will, if he can (the quarters are always in demand) arrange for his accommodation.

The club boasts a good ballroom, which, however, is all too small for the two or three hundred revellers who collect there on such festive occasions as the annual Armistice fancy dress ball. Billiard players are well catered for, and there is an excellent billiard room containing three good tables. The game is very popular in the station, especially amongst the Indian members of the club, some of whom are fine players.

FIG. 2.—The United Services Club, Secunderabad.

The winter "season" at Secunderabad is a very gay one. All the British regiments give balls during the season, and the 20th/29th Lancers usually hold several dances in their beautiful ballroom. In addition the Resident gives several balls and receptions annually, either in the magnificent Residency at Hyderabad or at Bolarum.

The number of ballrooms in the station is limited, none of the British units (with the exception of the cavalry, who have a small dance room in their mess) possessing one. To meet this need they one and all hire the

large, specially-prepared dancing drugget which belongs to the Railway Institute. This is spread by experts on a flat surface, usually the mess tennis courts, a multitude of newspapers placed underneath providing the necessary spring. The drugget, when properly spread, stretched and covered with French chalk, forms a good dancing surface (though rather tiring to one's feet), and one has the added enjoyment of dancing in the open. Some of the most successful dances in the history of the station have been given on this drugget, notably a very popular fancy dress ball given a few years ago by the officers of our own Corps.

The European community comprises the military, who largely predominate in point of numbers, Secunderabad being essentially a military station, the I.C.S. represented by the Resident to the Nizam and his two secretaries, the railway contingent who form a little community of their own out at Lalaguda, and other civilians, including the local representatives of large business firms and banks, professors at the Nizam's college, etc.

Many of the Indian Nawabs out at Hyderabad also entertain largely, and one of the chief charms of life in Secunderabad, to my mind, is the chance it gives one of accepting the hospitality so freely given of these members of the local ruling class, and thus increasing one's understanding of Indian life.

Calls.—Calling is done (luckily) almost entirely by post, the newcomer making the first call.

Among one's first duties on arrival in the station is, with the help of one's "burra memsahib" or other kind friend, to make a list from the local directory (which is published monthly at Rs. 1·8, and is cramfull of information) of all those to whom one should post cards.

There are, of course, the few on whom, according to the dictates of etiquette, personal calls should be made.

The Nizam and other Indian families have visitors' books in which one can write one's name.

Sport.—There is an excellent gymkhana club which runs hockey, tennis, cricket and golf. Although run separately from the Services Club it is closely associated with it, and nearly everyone in the station belongs to both; the monthly subscription to the Gymkhana Club is only Rs. 6 (Rs. 2·8 for ladies), and this allows one to participate in all the games.

When I was in the station the club ran a flourishing hockey team with by far the best ground in the district to play on.

The garrison have a very strong cricket team which makes a good account of itself during the annual quadrangular tournament (Europeans, Mohammedans, Hindus, Parsees), when Secunderabad goes cricket mad. The maidan during this week presents an appearance like that of an English county cricket ground during its cricket week, with gaily beflagged marquees, representing the various communities, encircling the ground. A sign of the times is the number of "purdah" marquees to be seen, through

the curtains of which many of the "grandes dames" from Hyderabad eagerly follow the game.

There is a nine-hole golf course on the maidan run by the gymkhana, but it is flat and uninteresting, not to be compared with the very sporting 18-hole Bolarum golf course which is run as a separate club for the nominal monthly subscription of Rs. 2.

There is always plenty of polo in the station, a series of very flourishing tournaments being held annually, one of the most popular of which is that for a challenge cup presented by Nawab Salar Jung (a grandson of the famous G.O.M. of Hyderabad).

The one time famous Golconda team, some years ago one of the finest polo sides in India, is now defunct, but many of its players still play for the Futteh Maidan (Hyderabad) team, amongst whom may be mentioned the renowned Major Shah-Mirza Beg, who is apparently as agile and clever at the game as ever.

(*To be continued.*)

Current Literature.

The Treatment of Human Anthrax. The *Lancet*, vol. ccx, No. 5341. January 9, 1926.—As regards general measures for the treatment of human cases of anthrax, Dr. Adrianus Pijper, of Pretoria, states that surgical interference is no longer in vogue; the cautery is no longer used and excision short of amputation of the limb does more harm than good, except perhaps in those somewhat hypothetical cases in which the disease is seen in the earliest stage before the microbes have invaded the deep tissues. In other cases, that is, in almost all, it is recommended that the patient should be kept in bed with the affected parts immobilized by sandbags and the local lesion treated by the application of dressings soaked in mild disinfectant.

Specific treatment with anti-anthrax serum, especially that known as Sclavo's serum, is said to yield good results.

The mode of action of the serum is not known; apparently it possesses no bactericidal properties, though it contains agglutinins and bacteriotropins. Little is known about the virulence of the infecting material, and as the anti-serum has not yet been standardized, its exact value is difficult to gauge. The administration of specific serum, however, has proved effective even during the last stages of the disease, and whenever the serum is available its application is strongly advocated in all stages. Large doses are recommended, commencing with at least thirty cubic centimetres given intravenously, and followed by smaller doses given subcutaneously every day.

Kraus, working in South America, claims that normal serum obtained

from sheep and cows possesses protective and curative properties against anthrax infection. This may be worth remembering in cases occurring under circumstances where specific anti-serum or other remedies are not available.

The main point of the paper is to advocate the chemical treatment of anthrax by salvarsan.

At the Pretoria Hospital, forty cases of cutaneous anthrax were successfully treated with this drug.

The routine of treatment is given as follows:—

After a diagnosis has been made by the usual laboratory methods, an injection of 0·6 gramme to 0·9 gramme neosalvarsan is administered intravenously, the exact dose depending on the condition of the patient, and the severity of the disease. The injection of salvarsan is repeated the next day. Some cases require a third injection on the fourth day, but this is exceptional. The symptoms begin to disappear on the second or third day. The temperature comes down to normal in five or six days, and the necrotic part drops off.

In the author's experience the salvarsan treatment of anthrax has never yet failed, and it has obvious advantages in that no special outlay or preparation is required, it can be applied at a moment's notice, and is safe, sure, and quick in action.

Insulin Treatment of Diabetes. By J. A. Nixon, C.M.G., M.D., F.R.C.P., *British Medical Journal*. January 16, 1926.—It is not proposed to give a comprehensive extract of this paper, which should be consulted in the original by those who are interested in the subject. The article concludes, however, with a very useful note on the transmission of blood-samples through the post for the purpose of blood-sugar estimation, which we think will be helpful to medical officers who may have to deal with cases of diabetes when far away from laboratory facilities.

The author recommends the following method of taking and preparing a blood-sample for sending by post:—

With a hypodermic syringe withdraw one cubic centimetre of blood and empty it into a small glass tube (such as is used in laboratories for precipitation tests—Widal, Wassermann, etc.) containing a few crystals of neutral potassium oxalate. Shake the blood thoroughly to mix it with the oxalate and prevent clotting. Wash the hypodermic syringe well with plain water and then absolute alcohol. Draw up into the syringe exactly 0·2 cubic centimetre (or five minims) of oxalated blood, then fill the syringe exactly to the one cubic centimetre mark (or to the twenty minim mark) with absolute alcohol. Shake well and empty the contents of the syringe into a second small glass tube. Cork tightly and dispatch, properly packed, by post. The mixture of oxalated blood and alcohol will contain a 1 in 5 solution if the syringe was graduated in cubic centimetres, and a 1 in 4 solution if graduated in minims. The blood-sugar can be estimated accurately from the alcoholic solution.

Dry Guinea-pig Complement. E. Hindle, writing in *Tropical Diseases Bulletin*, says: "The attention of laboratory workers is called to a preparation of dry guinea-pig complement, which is stated to be reliable and uniform in strength and to keep well almost indefinitely. The liquid complement is prepared by dissolving 1 part in 9 parts of water. Dr. H. B. Newham informs the writer that he has tested this preparation for Wassermann reactions against ordinary complement from fresh guinea-pigs' blood, and obtained exactly parallel results. The preparation is supplied by the Pharmaceutisches Instit. Ludwig Wilhelm Gans A.-G., Oberursel, Germany."

L. T. P.

Bender's Stain for Tubercle Bacilli. Abstracts from the *British Medical Journal* of October 10 and 24, 1925. K. A. Jensen (*Ugeskrift for Laeger*, August 13, 1925, p. 710), has tested at the Serum Institute in Copenhagen, Bender's modification of the Ziehl-Neelsen method of staining tubercle bacilli. Bender's modification differs from the Ziehl-Neelsen method in that he uses as a counterstain equal parts of absolute alcohol and a one per cent aqueous solution of picric acid for half a minute. He claims that his modification facilitates the distinction between genuine tubercle bacilli and other acid-fast bacilli. Jensen is much impressed by the value of this modification, which is a great help to examiners, who are apt to confuse red with blue colours, and which shows up tubercle bacilli clearly, even when the field is crowded with cells, the diffuse yellow background not hiding a single tubercle bacillus.

Jensen claims that Bender's modification not only gives positive results in more cases than does the Ziehl-Neelsen method, but it does so in a much shorter time.

J. Barcroft Anderson (London) writes: This method should really be much more efficient than even Jensen represents it to be, provided it is used in conjunction with a microscope having great depth of focus, because sputum specimens so stained show the bacilli with clearness when the layer of sputum is about six times as thick as would be desirable with the Ziehl-Neelsen stain; and consequently, where the bacilli are few, it should be possible to find one in about a sixth of the time occupied in searching over the same area of a preparation counterstained blue.

L. T. P.

Sugar Content of the Blood in Runners following a Marathon Race. By Burgess Gordon, M.D., and others. *Journal of the American Medical Association*, vol. lxxxv, No. 7, August 15, 1925. This article is a description of tests carried out on certain Marathon runners when the effects of administration of candies containing glucose were observed on the physical condition of the competitors during and after a race of twenty-five miles.

It had been shown that in the previous year's race the sugar content of certain runners had been diminished to a variable extent. The physical condition observed varied directly with the blood-sugar content. In 1925

experiments were made to ascertain at what stage in the race the blood sugar level was lowered.

In any exercise the blood-sugar level is raised above resting level for a varying period and tends to fall below the normal level after a certain time, depending on the severity of the work done.

In the racers, the blood-sugar level was elevated for the first few miles and fell usually between the fourteenth and twenty-fifth mile. For the actual race the runners were given a diet rich in carbohydrate before the race, and also candies were arranged for at certain stages in the race. The blood-sugar levels on this occasion remained normal in contrast to the hypoglycæmia noted the previous year, and the improvement in the physical condition of the runners was striking. The running time was faster and all the entrants remarked on their better subjective feelings.

It appears that the physical condition observed after prolonged exercise or severe work is akin to the symptoms of shock seen in hypoglycæmia following overdosage of insulin and is characterized by exhaustion, weakness, shock, etc.

The onset of these symptoms can be prevented by adequate and timely ingestion of carbohydrate, especially a readily assimilable variety like glucose.

The candy supplied contained about three grammes of glucose in each piece, and presumably the competitors were allowed to eat just as much as was insufficient to cause any digestive disturbance.

Reviews.

HULLO! IS THAT HOW YOU RIDE? By "Yoi-Over." London: H. and F. and G. Witherby. Price 10s. net.

This is by the author of "Hold hard! Hounds, please!" and is about the breeziest bit of recent reading that has reached our Editor—it is as far removed from the scientific treatise type of literature which finds friendly commentin these columns, as the "Pilgrim's Progress" is from the *Pink 'Un*. Whether he hunts or not, the individual who takes up this book will find one of the most delightful brands of sporting lingo right the way through that will set him wondering why there are not more books written in Yoi-Overese. Here's a snack of it: "I remember a farmer showing me a reproduction of a picture by a well-known artist, which stated by the inscription that it was a portrait of his friend the great poet, Mr. Slobbers." The farmer says: "What do 'ee think o' this?" As I did not reply he continued: "Darn me, but he's done the pohut, and seemingly he's got gallopin' consumptshun, or been crossed in love twice. Looks as if some old ale and ging*ar* would rattle him up a bit."

And not a bad tonic—could do with it ourselves for that matter. This old Yoi-Over and his priceless philosophy gets there every time, and makes you feel that the rank or the service element of a pension you may never pocket is not worth a second's consideration when there's a stout heart beating below your saddle—though owned by a hireling—and the pack has settled down to its work, heads up and sterns down, drinking in an exhilarating scent.

The types of seats that are described—balmy billy, sparking-plug, cocktail, "Oh-be-joyful," and some others, are priceless also; so is the whole book. There are nine delightful pen-and-ink sketches by the author, whose literary style is almost rivalled by his artistic faculties. Forty years as huntsman and whipper-in have taught him to develop a picturesque manner of speech that even immortal Jorrocks would be proud to copy.

M. B. H. R.

MANIPULATIVE SURGERY: PRINCIPLES AND PRACTICE. By A. G. Timbrell Fisher, M.C., F.R.C.S. London: H. K. Lewis and Co., Ltd. 1925. Pp. viii + 168. Price 7s. 6d.

This is a handy little book of 160 pages and 62 illustrations, written with the object of again drawing the attention of the medical profession to the great importance and value of manipulative surgery in the treatment, *in carefully selected cases*, of certain of the sequelæ of injuries and diseases particularly affecting the joints, muscles, tendons and fasciæ.

The author devotes Chapter I to some observations upon manipulative surgery, and gives a brief history of the influence of such men as John Hunter, John Hilton, Paget and Thomas on the treatment of joint diseases. He shows us how Dr. Wharton Hood's "Treatise on Bone-setting" was overlooked and his teaching neglected by the surgeons of his day, and it is not difficult to realize that apathy still exists and that ignorance is still rife in the management and treatment of many joint conditions.

Chapter II is devoted to the Pathology of Cases that bone-setters cure and provides very interesting reading.

Chapter III deals with Diagnosis, and the various symptoms and signs of adhesions in a joint are carefully discussed and their value in diagnosis is appraised.

The question of tuberculous disease in a joint is thoughtfully considered and is followed by a chapter on the general principles of treatment and on the treatment by manipulation of special regions. Amongst these latter the knee-joint receives full and detailed attention, and as it is the joint which is most frequently damaged by the soldier, the account of its anatomy, pathology and manipulation is of peculiar interest to the Army surgeon. Outside the abdomen, what serous cavity offers a more varied field to the diagnostician; and except the abdomen, in what human cavity can one seek and draw a more perfect blank? The manipulative technique

of this joint is well described and illustrated and the early uses of massage and movements in the after-treatment of this joint are wisely emphasized.

The author concludes with a short chapter on the dangers of misapplied manipulation and the importance in this connection of tubercular arthritis is plainly stated.

Without enunciating any new discoveries in the treatment of adhesions and other joint disabilities, this little book gives a clear and concise résumé of the more modern aspect of the treatment of these disorders and thereby more than justifies its production.

The fact that manipulative surgery has till recently found its chief exponents outside the circle of registered practitioners in no way lessens its value. Its merits are in process of rediscovery and this little book should go far to effect that purpose. J. W. H. H.

PUBLIC HEALTH LABORATORY WORK (CHEMISTRY). By H. R. Kenwood, C.M.G., M.B., F.R.S.E. Eighth edition. London: H. K. Lewis and Co., Ltd. 1925. Pp. xiii + 369. Price 12s. 6d.

When a standard textbook reaches its eighth edition little exists for the reviewer, except to announce the fact of publication and to rejoice that the work maintains its former excellence.

We can bestow no higher praise upon this volume than to say that it is as good as ever. It is not merely a textbook of laboratory methods and technique, but in matters of opinion, such as the interpretation of analyses and the significance of laboratory results, the author has been able to draw upon his wide experience to furnish the reader with helpful advice and suggestions. This new edition can be recommended to every laboratory worker as a sound guide which will never lead them astray.

When the next edition becomes due we hope that the author will find space in the chapter on "Acidimetry and Alkalimetry" for a description of simple laboratory methods for the estimation of pH values, and will add to the present section on the chemical analysis of air a chapter dealing in equal completeness with the physical examination of atmospheric conditions.

J. A. A.

POST-MORTEM APPEARANCES. By Jean M. Ross, M.B., B.S.Lond., M.R.C.S., L.R.C.P. Assistant Pathologist to St. Mary's Hospital. Publishers: Oxford University Press. 1925. Pp. vii. + 216. Price 7s. 6d.

The author's object has been to produce a post-mortem room manual of handy size, to provide the student with a verbal picture of the various pathological specimens laid before him at autopsy. This is admittedly a difficult task.

Professor Kettle in his preface states that the morbid anatomy of the common diseases could, hitherto, only be obtained by long practical experience, or by extensive reading. No textbook will replace practical experi-

ence, and we are of opinion that no handbook of this kind will ever replace any of the standard textbooks of pathology, which require judicious, rather than extensive reading by the student.

For a handbook of this size and title, there is some redundancy; the "Signs of Death," though dealt with briefly, hardly seem necessary in the post-mortem room. Each morbid condition is dealt with under two headings: External and Internal appearances; the descriptions as a rule are concise, though often, perhaps of necessity, rather vague. A satisfactory method of conducting a post-mortem is described, though the technique of reflecting the skin of the neck back to the sterno-mastoids as a preliminary to the removal of the tongue, fauces, etc., would appear to cause unnecessary disfigurement of the cadaver; undercutting the skin out to the sternomastoids and up to the ramus of the jaw, without reflecting, gives ample freedom for this operation.

The notes on the "Preservations of Specimens" are helpful.

The book gives the impression of a condensed textbook on Special Pathology, supplemented by post-mortem room notes. As a means of rapid revision for his professional examinations, this manual should prove of great value to the student. We feel that the subject matter of a book with this title should consist of a collection of good photographs with short explanatory notes, rather than descriptions, however concise.

H. T. F.

THE DIAGNOSIS AND TREATMENT OF TUBERCULOSIS OF THE HIP. By G. R. Girdlestone, B.M.Oxon., F.R.C.S. Humphrey Milford, Oxford University Press. Pp. x + 94. Price 8s. 6d. net.

In his small book on "Diagnosis and Treatment of Tuberculosis of the Hip," Mr. Girdlestone discusses every aspect of this disease and describes the stages of treatment in clear and explicit terms. He deals first with the importance of early diagnosis, and explains the methods which the practitioner should adopt when dealing with a possible case of this disease. From this he proceeds to the differential diagnosis, and shows that some doubtful cases must be treated as if they were undoubtedly tubercular. He emphasizes the want of a definite test for tuberculosis, comparable to the Wassermann or Sigma test for syphilis.

With regard to the value of radiography, it is stated that negative X-ray evidence must not be held to exclude tuberculosis of the hip. X-rays, he says, are partial and unwilling witnesses against the tubercle bacillus; but though slow to inculpate it, they are quick to lay the blame at other doors, and clearly expose the features of coxa vara, pseudocoxalgia, sepsis, osteoarthritis, dislocation, fibrocystic disease and tumours.

The second part of the book describes general and local treatment, and the treatment of sepsis. End results of operations and assessment tables form the third part. The book concludes with an interesting note on the mechanics of the hip-joint, and some final remarks on diagnosis, treatment

and end results. The author again stresses the importance of a preliminary diagnosis, through which the general practitioner by prompt action can lay the foundation that the specialist and his open-air hospital build on.

Sixty clear illustrations help to make the book interesting and attractive. Mr. Girdlestone has produced a work which, though small, will command much attention. M. B. H. R.

A CENTENARY SOUVENIR, 1825—1925. John Wright and Sons, Ltd.

This brochure describes briefly the progress during a century of a provincial printing and publishing business which was established in Bridge Street, Bristol, in 1825 by Mr. John Wright. Illustrations of the machinery and appliances which were in common use when the business was founded are given side by side with the plant of the present day, and the contrasts show the enormous advance in the technique of printing which has been made. The laborious work of the old-time compositor is now performed by machinery working at ten times the speed of hand work; the modern printing machine has one hundred times the productive capacity of the one hand press of the old days. Soft type largely composed of lead, tin and other metals which deteriorated after 50,000 impressions had been taken, has been duplicated by the processes of stereotyping and electrotyping. A mould is taken from a page of type and from this mould a duplicate copy in the form of a plate is made. Photographic processes have largely replaced the army of artists and wood engravers formerly required for the production of illustrations.

It is interesting to note that John Leech, of *Punch* fame, once applied to the firm for work in illustrating books.

Mr. John Wright commenced work as a printer and bookseller, but very soon publishing was added to printing. and the firm gradually became established in a large way, necessitating the frequent removal of the business to larger premises. The " Medical Annual," begun in 1883 by Dr. Percy Wilde, was taken over two years later by John Wright and Co., and is now a familiar volume with the medical profession. In 1913 the company was associated in the launching of the *British Journal of Surgery*, which proved an immediate success, and has now an established position in the forefront of similar productions.

WHAT TO DO IN CASES OF POISONING. By William Murrell, M.D., F.R.C.P. Thirteenth Edition. Revised by P. Hamill, M.D., D.Sc., F.R.C.P. London: H. K. Lewis and Co. Ltd. Pp. 276. Price 4s. 6d. net.

This well known book now enters upon its thirteenth edition, revised and brought up to date by Dr. P. Hamill. It is still a small, concise, emergency book, full of sound advice and useful directions for the practitioner when suddenly called upon to treat a case of poisoning.

Poison gases are, of course, omitted, but the book contains a very

comprehensive list of poisons, and the directions given are both practical and lucid. The index is complete and well arranged for quick reference. There is some medico-legal advice to be found in the book, and this is of considerable importance. "Murrell's Poisoning" is likely to continue in popularity owing to its useful hints and sound teaching.

M. B. H. R.

Migraine and other Common Neuroses. By F. O. Crookshank, M.D., F.R.C.P. London: Kegan Paul, Trench, Trübner and Co., Ltd. 1926. Pp. 101. Price 2s. 6d.

This book is one of the Psyche Minatures, a very small book, consisting of two lectures, the first entitled "The Psychological Interest in the Common Neuroses," the second, "Migraine and its Allies."

Naturally in a small book of this kind the author must be content with general statements. For those who wish to obtain a very condensed conception of the "New Psychology" the book might be recommended. A very brief description of the theories of Freud, Jung and Adler is included.

Many of the statements, particularly in the lecture on Migraine, may not appeal to readers, and one cannot agree that those unfortunates who suffer from migraine, neuralgia—even trigeminal neuralgia—are necessarily suffering from from an organ inferiority or inferiority complex, and that the diseases quoted are merely defence and flight and excuse mechanisms, which can be cured by psychological treatment.

The description of the treatment and care of hypothetical cases is not useful, generalized statements are too common, as is so frequently the case in books on this subject.

W. L. W.

Diseases of the Nervous System. By H. Campbell Thomson, M.D., F.R.C.P.Lond., and George Riddoch, M.D.Aber., F.R.C.P.Lond. Fourth Edition, revised. With 12 colour and 12 black-and-white plates, and 102 figures in the text. Pp. 521. Cassell and Company, Limited, London, New York, Toronto and Melbourne. 1925. Price 16s. net.

This is the fourth edition of Dr. Campbell Thomson's well known book, the preparation of which has been carried out under joint authorship with Dr. George Riddoch. In their preface the authors state that the notable advances in the science of neurology have necessitated a thorough revision. Attention has been particularly directed to the application of physiological principles in the study of disease, and as an example of this they draw attention to the endeavour to explain the reflex phenomena in injuries and diseases of the spinal cord in terms of applied physiology.

This book is eminently suited to students and practitioners, being handy, concise and very readable; and to those not acquainted with it is well worth studying.

To the average medical man who has not made it a special study the diagnosis of disease of the nervous system is a matter of difficulty and uncertainty, and probably in no other branch of medicine is the assistance of an expert so frequently sought.

The diagnosis in such cases depends on an intimate knowledge of the anatomy of the nervous system and its physiological functions, and is arrived at by the application of this knowledge. Hence the more profound this knowledge the more reliable and accurate does the diagnosis become.

That this principle has guided the arrangement of the book is evident.

The first section (76 pages) deals with the anatomy and physiology of the brain, spinal cord and autonomic system, the interpretation of signs, paths of infection and methods of examination, and presents a difficult subject clearly and concisely, and in a most readable form.

The headings of the other sections are—diseases of the peripheral nerves, diseases of the spinal cord, syphilis of the nervous system, epidemic diseases of the central nervous system, diseases of the brain and diseases of general origin, heredo-familial disorders, psycho-neuroses and occupation neuroses, other nervous diseases.

The letterpress is good, and the illustrations, which are numerous, are clear and well produced.

Both for its excellence as a manual, and its handy size, this book is commended to Army medical officers. J. C. K.

THE TREATMENT OF FRACTURES AND DISLOCATIONS IN GENERAL PRACTICE. By C. Max Page and W. Rowley Bristow. Humphrey Milford, Oxford University Press. Price 12s. 6d. net.

This is the second edition of an excellent manual, and in order to increase its practical value the treatment of the commoner dislocations is included.

The object of the authors is to provide a simple book of reference for the general practitioner or house surgeon, who may be called upon to deal with fractures without the use of elaborate apparatus. No attempt is made to describe operative measures in detail.

The wide divergencies in the methods of treatment are very confusing to anyone who has but a limited practical experience, and the methods described are intended for average conditions. The manual does not aim at being a textbook, and many clinical methods have been omitted.

The first portion of the book is devoted to the diagnosis, repair, and treatment of fractures generally. In the opinion of the authors the best average results will be obtained if operation is only resorted to in a limited number of cases.

The second portion of the book deals with special fractures and dislocations.

In the articles describing fractures round the elbow and wrist many useful and interesting points are brought out.

Some of the newest methods of treating fractures are accurately described.

Without doubt the book meets a definite want, and should be of the greatest service to general practitioners. H. C. S.

Correspondence.

THE NATURE OF *RICKETTSIA MELOPHAGI.*

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—In a note upon the nucleal reaction, as a test for chromatin, in this number of the Journal, I refer (p. 358) to a paper by Thiel (*Arch. Protistenk*, 52, 1925, p. 394), who was unable to obtain a positive result when applying this reaction to *Rickettsia melophagi.* According to the view I have elaborated (in this Journal, vol. 40, 1923, pp. 81, 241, and vol. 42, 1924, pp. 121, 175) of the non-living nature of these bodies, this negative result is what I should have expected. I would like to take this opportunity of briefly replying to a point Thiel makes in criticism of my derivation of *R. melophagi* principally from the metachromatic granules formed in the cytoplasm of the degenerating crithidiæ. Thiel finds that while the metachromatic granules give the so-called volutin-reaction of Meyer, the "rickettsias" do not. Further, if a preparation which has been treated for the volutin-reaction is then washed with five per cent sodium carbonate, the granules are dissolved, while the "rickettsias" are not. Hence, Thiel concludes that metachromatic granules and "rickettsias" are different things.

The author has left out of account, however, one important factor which must be borne in mind. Since the metachromatic granules are not living organisms, but products resulting from the digestion, perhaps slightly modified, of the absorbed blood (to which explanation of their origin Thiel also, in part at least, assents), when the crithidiæ die and disintegrate and these granules are set free and come directly under the influence of the digestive juices of the ked, it is by no means unlikely that they undergo a further chemical change. And this further alteration in their composition may explain their different behaviour (as "rickettsias" now) towards certain reagents. As a comparable instance, I may point out that, in the case of *R. pediculi*, the pigment-grains themselves do not stain with Giemsa; but after their chemical change into "rickettsias," which is correlated, in my opinion, with the loss of the iron, they do stain with Giemsa (*vide* my second paper, referred to above).

The title of Thiel's paper is "What is *Rickettsia melophagi?*" The only attempt to give any positive answer to this question is the author's observation (p. 400) that, in dead and disintegrating crithidiæ, the nuclear material is represented by a clump of granules which no longer give the

nucleal reaction; and his statement that, at this stage, there is very great similarity between nuclear granules and "rickettsias." That is to say, just one of the modes by which I consider "rickettsias" are produced is tentatively indicated also by Thiel.

I am, sir, etc.,
H. M. Woodcock,

Lister Institute of Preventive Medicine,
March 10, 1926.

TREATMENT OF INJURIES IN THE NEIGHBOURHOOD OF JOINTS.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

Sir,—You published an article by me in your December issue, pointing out the value of treatment directed towards the production of normal muscle about the knee-joint in cases of "chronic knees."

I now write to point out that the same treatment might very well be applied to cases of recurring dislocation of the shoulder-joint, as the reflex group inco-ordination and reflex muscle atrophy are bound to be severe in such cases.

I have only treated one such case on the above lines.

An officer had dislocated one shoulder twice, and the other three or four times, he could not remember which.

When I saw him he was almost afraid to raise his hands over his head in such necessary actions as putting on his shirt, etc.

He said that he felt afraid that the joint would go out every time, and it was making him very nervous.

Treatment was directed solely to building up and educating the musculature about his shoulders, and lasted three months.

He now states (i.e., four months since treatment was discontinued) that he has forgotten about his shoulders, and again leads a normal existence, and that all the afraid feeling and nervousness have left him.

So far, so good; but it is not possible to pronounce him definitely cured after only four months' treatment. I think, however, that the results are so far sufficiently promising to warrant my again trespassing on your columns.

I am, etc.,
G. Gelston Atkins,
Captain R.A.M.C.

Medical Inspection Room,
New Road, Woolwich.
January 28, 1926.

A MILITARY PHARMACOPŒIA AND VADE-MECUM.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

Sir,—In 1910 a letter appeared in the Corps' Journal from (the then) Major F. J. Wade-Brown, R.A.M.C., advocating the compilation of a pharmacopœia for military hospitals. The letter so well expressed a

need which I and many other officers felt, that we were convinced early action in the matter would probably be taken in our progressive Corps. Shortly afterwards another letter on the same subject appeared in the Corps' Journal from a very senior officer, who, as far as I can remember, severely castigated the writer of the original letter, and said that he considered all medical officers should make a habit of writing out their prescriptions themselves, and not trust to stock mixtures. There apparently the matter ended; possibly the war prevented the appearance of the hoped-for booklet. I should like, however, to bring forward the subject again. We all know that for routine medical work, both military and civilian, the use of well-tried and approved stock mixtures is essential and largely utilized by even the highest members of the medical profession. The present position is chaotic, every military hospital has its own little list of approved mixtures, changed at intervals by the vagaries of medical officers. It is most disconcerting for a medical officer in his frequent changes of station to find that the commonest remedies in the medical inspection room have a composition different from those to which he has previously been accustomed. A military pharmacopœia could have so much useful information in it, apart from the purely drug question, and, in fact, be a military medical vade-mecum for use both in peace and war.

May I be allowed, Sir, to quote *in extenso* the letter (previously referred to) published by you sixteen years ago, but which is still so much to the point? Major Wade-Brown wrote in April, 1910: "Seeing that all civil hospitals of any size have their own pharmacopœias, might I suggest that the time has arrived when one should be compiled for use in military hospitals? At the present moment all that exists in this direction is a list in each dispensary, and few officers know what they are prescribing when ordering mist. expect., or any other stock mixture. Perhaps some of our medical specialists could be formed into a small committee, and between them compose an Army Medical Pharmacopœia to which all officers should be ordered to adhere when prescribing. In addition to formulæ for men, women and children, useful appendices might be added containing information about mercurial cream, various sera, diet scales, diet sheets, medical history sheets, invaliding documents, contents of medical companions, surgical haversacks, panniers and many other small matters of interest. I am sure most medical officers, and dispensers especially, would welcome such a book."

I am, etc.,

W. E. C. LUNN,

January 19, 1926. *Major, R.A.M.C.*

A LIST OF MEDICAL OFFICERS OF THE ARMY, 1660 TO 1727.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

DEAR SIR,—With reference to your kindly notice of my Roll of early Army Medical Officers in the April number of the Journal, may I point out that Richard Wiseman was never entered in the Commission or Notification Books, from which the names and dates in the Roll in question were compiled.

In fact, he does not appear to have done any military duty after the Battle of Worcester in 1651.

There must have been many doctors attached to but not commissioned in the Army before and after the date of the beginning of the Standing Army in 1660, but their records call for research on somewhat different lines to those I have used in this case.

It was Sir Samuel and not Sir Edmund Garth who was Physician General to the Land Forces and Physician in Ordinary to George I.

London, I am, etc.,
April, 1926. A. PETERKIN.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Any demand for *reprints, additional to the above,* or for excerpts must be forwarded at the time of submission of the article for publication.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are inserted free of charge to subscribers. All these communications should be written upon one side of the paper only; they should by preference be typewritten; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS." War Office, Whitehall, S.W.1.

The Committee has sanctioned the publication of correspondence on matters of interest to the Corps, and of articles of a non-scientific character under a nom-de-plume. These communications must, however, be approved by the Editor before publication.

Cheques or Postal Orders for Subscriptions, etc., should be made payable to the "Hon. Manager, Journal R.A.M.C." and crossed "Holt & Co."

All communications should be addressed to THE HON. MANAGER, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," WAR OFFICE, WHITEHALL, S.W. 1.

VALENTINE'S PREPARATION
NUTRIO PER ME
VOLUME 1 4/5 OZ.
MEAT JUICE

No. 6. June, 1926. Vol. XLVI.

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

LIEUTENANT-COLONEL A. E. HAMERTON, C.M.G., D.S.O., R.A.M.C.

ISSUED MONTHLY

Printed and Published by
JOHN BALE, SONS & DANIELSSON, LTD.
83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

Price Two Shillings net.

VOL. XLVI. JUNE, 1926. No. 6.

Journal
of the
Royal Army Medical Corps.

Original Communications.

TUBERCULOSIS AS A PROBLEM FOR THE ROYAL ARMY MEDICAL CORPS.

By COLONEL S. LYLE CUMMINS, C.B., C.M.G. M.D., A.M.S. (R.P.)
David Davies Professor of Tuberculosis, Welsh National School of Medicine, Cardiff.

MOST people who have studied the subject are aware of the debt which hygiene and tropical medicine owe to the work of officers in the Army Medical Services. Even the most hardened critic of military medical work is unable to deny the contributions to malaria of Laveran and Ronald Ross, and to other branches of protozoology by Lewis, Bruce and Leishman; while the work of hygienists such as Notter, Firth, Horrocks and many others, though less widely known, is a great contribution to preventive medicine, the value of which is never questioned by experts. But it is not so universally recognized that the whole trend of modern thought on tuberculosis owes its direction to the work of an Army medical officer, J. A. Villemin, who was a Professor at the Ecole Impériale du Val-de-Grâce, Paris, in 1868, when he published his classical work "Études sur la Tuberculose," proving the infectivity of tuberculosis. This conclusive demonstration of the infectivity of tuberculosis by carefully executed animal experiments preceded the discovery of the tubercle bacillus by Robert Koch by nearly twenty years. So convincing were the experiments of Villemin that, although opposed by a section of the profession, his conclusions soon gained wide confirmation and general acceptance. They were early endorsed, for instance, by Sir John Simon, of the Local Government Board, as is pointed out by Dr. Coutts in a recent monograph. It may fairly be claimed then, that as in the case of malaria, trypanosomiasis, leishmaniasis and sandfly fever, it is to an Army medical officer that we owe the fundamental observations on which modern views about tuberculosis are based.

If our knowledge of the infectivity of tuberculosis is a debt to the French

26

army, the American army may fairly claim that in Colonel Bushnell they produced an investigator whose work has thrown a flood of light upon the epidemiology of this disease. And the traditional interest of the French Army Medical Service in tuberculosis found further expression during the Great War in the fact that a definite organization was brought into existence for the study of tuberculosis and cognate conditions amongst the colonial troops imported by France to supplement her standing army in Europe. The result of this wise measure was that A. Borrel, a medical scientist of great distinction, was delegated to this work, and was enabled to produce a record second to none in importance upon the epidemiology, pathology and clinical type of tuberculosis amongst the Senegalese levies (*Ann. de l'Institut Pasteur*, vol. xxxiv, No. 3, March, 1920).

It is to be regretted that with all the wonderful developments which took place in the zone of the British armies in France and Flanders this question of the tuberculosis of colonial contingents received but scant attention. The opportunity might have been entirely lost had it not been for the careful records of mortality from infectious diseases, including tuberculosis, kept by Colonel (now Major-General Sir) W. W. O. Beveridge, and which were later available for study. The fact must, I fear, be admitted that so far the British Royal Army Medical Corps, an organization which has been, perhaps, more fruitful than the medical service of any other army in its contributions to medical science, has made no addition of first-rate importance to our knowledge of tuberculosis, and this, perhaps, because it is our policy to discharge as soon as possible all soldiers diagonised as tuberculous in the interests of the patients and of their comrades. There is much to be said for this procedure from many points of view, and I propose to discuss it later in this paper. But even with this loss of clinical material there remain a great many possibilities for the investigation of tuberculosis, which can be better carried out in the Army than anywhere else.

Four important lines of investigation may be formulated under headings as follows :—

(1) The recording of clinical types on a definite system of classification.

(2) Examination of post-mortem material on pre-arranged and systematic lines.

(3) The application of von Pirquet tuberculin tests for the study of the distribution of infection as opposed to disease amongst recruits.

(4) Investigations into the tuberculosis of native troops, and, where possible, native civilians by medical officers serving in our colonies and dependencies.

Investigations under these four headings are calculated to throw much light on tuberculosis in general, and might furnish information of the highest value. Let us turn for a moment to consider them in greater detail.

The Study of Clinical Type on a Definite System of Classification.

Tuberculosis is a general disease and manifests itself in many different tissues and organs. There are mysteries connected with its distribution throughout the body which still await solution. Why, for instance, does it so rarely attack muscular tissues and so frequently attack bones and joints? There is no mystery about its predilection for glands, since these are interposed along the lymphatic channels between the portals of entry of the bacillus and the deeper tissues and organs; nor is it difficult to understand why the lungs are so frequently affected, since these organs represent in themselves the main portal of entry for air-borne infection as well as containing a vast capillary network in which may be arrested the bacillary emboli which enter the venous circulation from caseating foci throughout the body. But apart from these obvious sites of infection there remain many problems as yet unsolved relating to the location of secondary tuberculosis in the various organs.

Why is it, for instance, that, although myriads of tubercle bacilli are constantly being swallowed by persons suffering from pulmonary tuberculosis, the intestine so often escapes infection? How does it happen that certain patients get tuberculous laryngitis quite early in the course of tubercle of the lungs, while others continue to expel myriads of germs from vast lung cavities and yet the larynx, though exposed to constant contamination, remains healthy? These are only a few of the puzzling features which present themselves when one begins to study variation in clinical type. But apart from varieties dependent on differences of localization throughout the body there remain the problems of variation in clinical type in the tuberculosis of any given organ. Tuberculosis of the lungs, for instance, presents an infinite series of types ranging from the unrecognized focus at an apex accompanied by great enlargement of the bronchial and mediastinal glands to the widely distributed, easily recognized, and too often progressive phthisis affecting the greater part of both lungs and yet with relatively slight disease of the bronchial and mediastinal glands. Much interest attaches to these varieties of clinical type in tuberculosis because they tend to vary on the one hand with the age of the patient and on the other with his previous history. It is common, for instance, to find in adults, such as the Senegalese soldiers already referred to, when brought into contact with infection for the first time, a clinical type comparable in many ways with what is normally met with in infants and young children in European communities.

This consideration suggests that the study of clinical type may prove to have a bearing not only on prognosis and treatment but also upon the epidemiology of the disease.

I have attempted to discuss this matter in a short paper, "The Clinical Differences in the Course of Tuberculosis seen in various Age-groups and

Races" (*Journal of State Medicine*, May, 1922, vol. xxx, No. 5, p. 203), which may be referred to by those interested in the matter. I then formulated my views as follows:—

"That when, in a given community, the percentage of positive von Pirquets tends to be high, the clinical type in that community tends to be localized and chronic, and the death-rate of the middle-age type; and that when the percentage of positive von Pirquet tests is low, the prevalent clinical type tends to be acute, generalized, and characterized by the 'young adult' type of mortality."

A classification intended to throw light on these questions has been devised by me for use in Wales and is now being applied by my colleagues throughout the principality; the results being sent in for analysis on an inquiry card. The classification itself has been described in detail in the *British Journal of Tuberculosis*, vol. xviii, No. 2, April, 1924, p. 43.

There are many other classifications, some much simpler than that referred to and at the same time of great utility. That, for instance, devised by Sir Robert Philip of Edinburgh and well known to his students, is to be highly commended for clinical purposes; while a classification recently set forth by the Ministry of Health in Circular 37/T is easily applied and covers a considerable field.

In order to make full use of the opportunities for the study of the disease throughout the British Army, there is need for a standard scheme of classification for pulmonary and other forms of tuberculosis as they occur in a population of military age drawn from every section of the general male population.

POST-MORTEM EXAMINATIONS.

An example of the value of careful post-mortem records in tuberculosis applied to a colonial community will be found in a recent paper by Dr. H. H. Scott in the *Annals of Tropical Medicine and Parasitology*, vol. xv, No. 3, of September 30, 1921, and when post-mortem examinations are made the investigator could not do better than adopt the system of records utilized by Dr. Scott in this research, which extended to 300 consecutive cases of death from tuberculosis in Hong Kong.

The post-mortem findings of Borrel in relation to tuberculosis of the Senegalese troops in France are given in his paper already referred to and speak for themselves.

Another recent paper of the highest interest is by Dr. A. Powell, of Bombay, in which he bases his conclusions on over 8,000 post-mortems on Indians. His paper, which includes clinical data, appeared in the *Proceedings of the Royal Society of Medicine*, Section of Tropical Diseases and Parasitology, September 1922, vol. xv, No. 11, and repays careful study. But the opportunity afforded for post-mortem investigation by our Army medical officers is not confined to the examination of those dying of tuberculosis. A still more fruitful field is to be found in the careful search

for tuberculous lesions in the cadavers of those dying from other diseases, wounds and injuries.

In this direction, the classical investigations of Naegeli (*Archiv f. Path. Anat.*, Berlin, T. 160, p. 426) and Burghardt (*Zeit. f. Hyg. u. Infect.*, Leipzig, T. 53, p. 139) indicate a line of research which needs to be applied widely throughout an army such as ours and would be sure to enlighten us about the distribution of tuberculosis in our adult population.

A significant observation by Opie (Opie and Anderson, *American Review of Tuberculosis*, 1920, col. 4, p. 29), for instance, in which, during the examination of cadavers of British soldiers in France, he found, out of 66 cases, 18 or 27 per cent with caseous or calcified mesenteric glands, indicates how military post-mortems may serve to throw light on the prevalence of mesenteric infections in early life.

Tuberculin Tests.

It is now universally realized that the von Pirquet cutaneous tuberculin test is too sensitive to be of real value in clinical diagnosis, except that a negative in an adult or a positive in an infant is so exceptional as to be significant. Its value, however, as an index of the distribution of infection throughout a population is extreme.

If we are to understand the problems of tuberculosis in a given community we require to set against the incidence, mortality and clinical type of diagnosed tuberculosis, statistics as to the distribution of infection as shown by cutaneous tuberculin tests. This need has been fully realized by the French colonial services. In 1911 Calmette inaugurated an extensive investigation into the "tuberculin index" amongst the various races in the French colonies and statistics of the highest interest have steadily accumulated since that date.

In spite of our colonial possessions, we can point to no comparable investigation to enlighten us about the tuberculosis of our subject and dependent races. But it is safe to say that a just appreciation of the significance of the tuberculin index would be invaluable in connexion with measures for the health of native labour contingents either in our colonial industrial developments or in the course of military operations.

But it is not only in the colonies that such investigations are required. Differences of the most interesting and significant kind underlie the variations in incidence and mortality of tuberculosis in these islands and these too await systematic investigation.

If it were possible to carry out a cutaneous tuberculin test on every recruit joining his depot and to record the result on his medical history sheet, we should be able, in the course of years, to accumulate facts of the highest interest bearing on the clinical types of tuberculosis subsequently arising; while it would be of great utility to ascertain the percentage of positive and negative tuberculin tests in the different recruiting areas of England and Wales.

In no other organization except the Army are there similar facilities for gleaning information on a point which is of fundamental importance.

Tuberculosis in our Colonies and Dependencies.

The importance of tuberculin tests applied to colonial troops and to the natives of tropical dependencies has already been mentioned and not much remains to be said.

The almost complete absence of tuberculosis amongst the majority of primitive tribes in their natural surroundings and the intense susceptibility of these people when brought for the first time in contact with the tuberculized populations of the West has long been recognized. Wm. Budd in suggesting the infectivity of tuberculosis on the grounds of its distribution and natural history called attention to this susceptibility of primitive tribes in the *Lancet* of 1867, vol. 2, p. 451. Villemin, already quoted, devoted a whole chapter to the subject and attributed the appearance of tuberculosis in almost epidemic form amongst such communities to contact with Europeans. The point need not be laboured as it is now generally admitted, and yet the susceptibility of such races to tuberculosis is often forgotten when it is a question of raising labour for industrial developments or for recruitment during critical periods in the course of wars.

The very high mortality amongst the men of our Native Labour Corps in France and Flanders in 1918 has been described in the Pathological Volume of the "Medical History of the War." While everything possible was done to ameliorate the conditions of life in these Corps during their service in France, and while it is admitted that they enjoyed far greater comfort in their locations behind the line than did our own troops under trench conditions in contact with the enemy, their susceptibility was such that many of them contracted tuberculosis of a progressive and fatal type; and doubtless many others developed it later as the result of infection contracted during the war.

Wastage of this kind ought to be avoided in future and this means that the problems of prevention must be studied in advance.

The future is not without hope that it may be possible to immunize susceptible persons by means of the B.C.G. vaccine of Calmette and Guerin. This procedure cannot safely be applied to persons already infected with tuberculosis and it is, therefore, restricted to the immunization of newborn infants in European countries; but there seems no reason why it should not be tried on the non-reactive adults of primitive races upon their being engaged for industrial or military purposes.

The experiments on apes at the Pasteur Institute Monkey Farm at Kindia have been so strikingly successful as to justify the warmest hopes for ultimate success ("Expériences de Vaccination des Singes contre la Tuberculose par le B.C.G.," J. Wilbert, *Annales de l'Institut Pasteur*,

août, 1925, *No.* 8, 39*e année*) and there undoubtedly exists the fullest justification for tentative trials of this living vaccine amongst primitive adults, such as the natives of the Bahr-el-Ghazal and other isolated areas. And there should be many opportunities of applying it to newly born infants in India, Burma, the Sudan and many other places where tuberculosis is claiming an increasing number of victims amongst native populations and where any reasonably safe procedure designed to render them more resistant is urgently wanted and merits a thorough trial.

Tuberculosis is, undoubtedly, one of the most important diseases with which the medical profession has to deal, and as I look back on my time of service in the Army I cannot help feeling that a great opportunity for adding to our knowledge lies at the disposal of the Royal Army Medical Corps.

THE INITIAL TREATMENT OF A FRACTURED LIMB.[1]

By MEURICE SINCLAIR, C.M.G., M.B., B.Ch.

Surgical Specialist, Ministry of Pensions, London; late Major Royal Army Medical Corps and Officer in Charge, Special Fracture Wards, 8th Stationary Hospital, Wimereux, British Expeditionary Force, 1915-1918; *Specialist in Orthopædic Surgery to the Army.*

When a medical man is called upon to attend a case of fracture of a limb, the occasion is generally that of an accident on the hunting field, a motor smash on a country high road, or possibly an ordinary casualty on the streets or in the factory of a city. In the latter two instances one is more conveniently placed, as the personnel and material for treatment are probably more ready to hand, whereas in the former urgencies this is generally not so. But, in all cases, the treatment should commence from the time that the injured person is first seen by the surgeon or first-aid worker, and should be continuous and consecutive until cure is effected.

The surgeon has to decide at once whether he will take charge of the case himself, and so must frame his rules of procedure in accordance with his own experience of success with manipulation or other applicable methods. Even with the help of modern fracture equipment and the X-ray screen, a large and varied experience of manipulative treatment of deformities does not necessarily ensure that this form of treatment will be unfailingly successful in producing perfect reposition; it is, therefore, necessary in a percentage of cases to have recourse to such expedients as mechanical pulls, and when these fail, then to attack the seat of fracture by direct operation, with plating, wiring, bolting, bone grafting, &c.

When this is indicated, the operation should be done within a short space of time after the injury, and then only when perfect asepsis can be obtained. In any case the surgeon's immediate action is demanded, and the first essential is to steady the limb, and temporarily fix the broken bone or bones, so that no further movement of them is permitted; by so doing hæmorrhage, further laceration of soft structures, pain and shock, will be diminished.

In the case of the upper extremity, bandaging the arm to the side may perhaps be sufficient, but in the case of the lower extremity some form of splint is required, and there are two splints which do efficiently meet the case in all fractures of both upper and lower limbs. These two splints were so well tested and proved in the Great War, that I cannot conceive any more critical trials to which an apparatus could be subjected.

First-aid Treatment of the Arm.

Every fracture above the lower third of the forearm can be efficiently treated by the application of the "swivel-arm Thomas's splint." This

[1] Reprinted from the *Practitioner.*

instrument differs from "Thomas's knee splint" only in that the ring is round and made to swivel at the points of attachment to the side bars, instead of being oval and fixed obliquely to the bars. The application of the splint is so very simple. A temporary extension is taken by means of a double hitch of bandage placed over the well-padded wrist. The two ends of the bandage are tied to the end of the splint, with a pull sufficient to immobilize the fracture. The counter extension is taken from the anterior and posterior axillary folds when the arm is at the side, but from the side wall of the chest in the region of the armpit when the arm is abducted. This apparatus allows the arm to be brought in to the side of the body without increasing the extension, and so facilitates the transport of the case. A circular bandage is applied enclosing the arm and side bars from the hand up to the ring of the splint, in order to complete the immobilization of the fracture. The splint is equally suitable both in the initial and subsequent treatment of any fracture of the arm from the shoulder-joint downwards.

Just as the splint above described may be used for all fractures of the arm above the wrist, so, in the leg, the first-aid treatment of all fractures above the ankle-joint can be efficiently carried out by the application of the Thomas knee splint, which is by far the finest piece of apparatus in our fracture equipment. It is applied in the following way. Maintaining manual extension on the ankle *all* the time, the leg is threaded through the ring of the splint without removing the trousers. If there is a selection of splints with different-sized rings to hand, then the transverse circumferential measurement of the thigh over the trousers should be made at the gluteal fold. To this figure add 1 inch to allow for the obliquity of the ring, 1 inch for clothing, and 2 inches for possible subsequent swelling, and this should be the inside circumferential measurement of the padded ring. Thereby all accessory padding which would be necessary for an unduly large ring will be obviated. The ring is pushed up gradually and firmly against the tuber ischii and kept there by the operator, who holds the distal end of the splint against his own thigh, at the same time supporting the patient's leg posteriorly at the site of fracture with his left hand and maintaining the extension on the ankle with his right hand, which is held underneath the inner side bar.

An assistant takes a six-inch roller bandage, ties the end to the outer side bar near the ring, and passes it behind the thigh from side to side, first over the inner bar and then back over the outer one, and so on until the whole of the posterior aspect of the limb is supported; the bandage is then tied to one or other of the side bars.

If the operator has a "boot clamp" (fig. 1), he fixes it obliquely like the skewer to the boot, as explained below (fig. 2); if not, he then takes a rigid metal rod or skewer, about twelve inches long and three-sixteenths inches in diameter, pointed at one end. This is passed obliquely through the boot between the sole of the foot and the sole of the boot. The hole on the

outer side should be about three inches from the front surface of the heel, and the inner hole one inch from this surface (fig. 3).

This allows the leg to lie in external rotation, which is the natural position of the leg in the recumbent position, and the one in which it ought to be ultimately splinted.

A cork or narrow roller bandage is placed over the pointed end of the skewer for safety, and a piece of tape or bandage attached to each

FIG. 1.

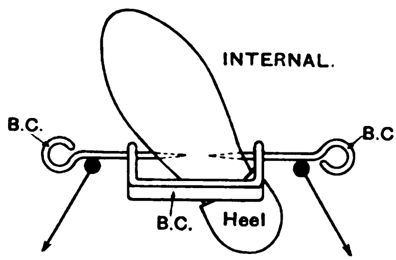


FIG. 2.—Sections through side bars of Thomas's splint. The boot clamp, obliquely fixed to boot and resting on side bars.

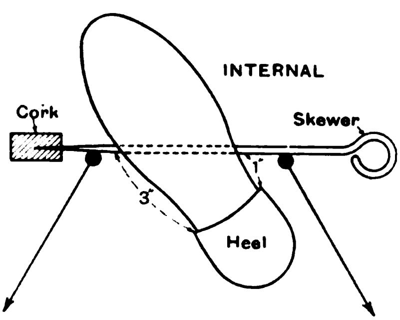


FIG. 3.—Sections through external and internal bars of Thomas's splint.

extremity of the skewer. These are made taut, and tied to the V at the end of the splint with sufficient tension to maintain the requisite extension.

The patient is lifted on to a stretcher, and a "suspension bar" is applied, from which the side bars of the splint are slung. After a limb has once been splinted, the side bars of the Thomas should *never* be allowed to rest on the same plane as that on which the patient's body and sound leg are lying. If this occurs, the side bars fall back and the limb is forced too far forward, thus increasing the deformity, causing pain, and so altering the correct relative position of the limb to the splint into a faulty one. An

alternative method of raising the splint is either to attach a "splint-prop" to the end of the splint, or to rest the end of the Thomas below the level of the sole of the boot on some form of support, such as rolled-up clothing, etc. If the fracture be simple, the clothing may or may not be cut off the leg at the site of fracture. If a wound be present, the skin round it should be sterilized by painting with three per cent picric acid in methylated spirit, any obvious dirt or other foreign body picked out, and the picric solution applied to the superficial surface of the wound, which is then covered with a sterile dressing, and finally a prophylactic dose of tetanus antitoxin given. A firm pad may be placed on either side of the knee between the limb and the side bars and the leg and splint bandaged at this level; this will give greater security, and will compensate for the extension through the foot not being a very great one. Cotton wool, or padding, should be placed in the space between the thigh and ring of the splint, so as to make an unduly large ring fit more accurately. Any such padding between the outer bar and the thigh will prevent the ring from slipping inwards and losing its purchase against the tuber ischii and so coming in contact with the middle line of the perineum. Padding between the anterior half of the ring and the anterior surface of the thigh will render it impossible for the leg to be lifted up into the forepart of the splint, thereby allowing the ring to slip up beyond the ischial tuberosity. This is an all-important point, for the tuberosity is the only place on which the counter-extension can be taken.

Too much extension must not be taken through the foot, and this extension must only be considered as temporarily applied for transport to hospital or nursing home, where permanent extension is substituted as soon as possible. If the temporary extension is too great or persisted in too long, pressure of the boot, especially in cold weather, will cause obstruction of the dorsalis pedis artery. This remark similarly applies to extension by means of a clove-hitch round the ankle or wrist.

The fracture having been extended and immobilized the patient is now ready for transport in ambulance or train. He should be kept warm to combat shock and pain until he arrives at hospital, and morphia may be administered with the same objects in view. On admission to hospital the patient is not necessarily removed from the stretcher at once. A varying degree of shock may contra-indicate removal and suggest rather rest and resuscitative measures for some hours. As soon as the patient is in a fit state, antero-posterior and lateral radiograms should be taken, or a stereoscopic pair may be substituted, if the injury is too high up for the lateral view to be obtained. The further procedure will be governed by the clinical findings and the interpretation of these radiograms. The possibility of a nerve lesion should always be considered. Injuries of the peripheral nerves are liable to be overlooked, as the symptoms are frequently overshadowed by the manifest pain at the site of fracture. It is preferable to make this diagnosis before a general anæsthetic is administered. Furthermore, a more accurate prognosis can be offered.

I need hardly say that routine investigation by means of X-ray examination is not only necessary, but essential, if the best results are to be obtained. Perchance it may not be available, and then the fracture is put up in the best position, as ascertainable by the eye, by measurements, etc. Extension is applied until reduction of deformity is judged to have taken place and a second pair of radiograms, if possible, is taken with the patient in bed without altering any details of splinting. This will afford a correct appreciation of the condition which is presented, and prove if the reduction or setting of the fragments has been accomplished.

If the position is satisfactory, the next pair of radiograms is taken when the fracture is beginning to mend, and this gives an insight to the progress of the case and if the correction is being maintained. And when callus is visible further attempts to obtain exact position (not already obtained) will no longer be possible unless open operation is undertaken. The necessity of this will, of course, depend on the amount of deformity presented, the loss of function that will follow if the displacement is not dealt with, and the delayed convalescence which will ensue. However, young callus can be bent, and may be likened to a candle in a candlestick on a hot day in summer. It will bend to almost any degree, and so will callus if it be subjected to a gradual and constant force. But, just like a candle, it will crack if too abrupt a strain be put upon it, such as a speedy attempt to correct deformity. Still the correction of alignment can often be obtained by a slow and regular stress.

Before allowing a patient to walk without the aid of apparatus, two radiograms should always be taken at right angles to one another. This is the most accurate way of estimating the amount of consolidation that is present in length, in breadth, and in thickness. It may even be possible in a recent fracture to obtain a radiogram in one plane, which will not show any bony lesion whatsoever; in this case, a grave error in diagnosis and prognosis will result from the taking of the picture in only one plane.

For the successful treatment of fractures it is more than ancillary, it is essential, that a mobile X-ray plant should be available, to be brought to photograph the patient's limb when he is lying in bed. The moving of a patient to an X-ray room is liable to interfere with the extension which is being maintained, and thereby may jeopardize the end-result of his treatment. If mobile X-ray plants were available for the use of any medical practitioner who required one, in my opinion great advantage would accrue both to the patient and the profession.

Every fracture presents four problems of paramount importance:—

(1) The correction of the deformity—or the so-called setting of the fracture. This should be done at the earliest possible moment after the injury has occurred.

(2) The maintenance of the corrected position until finality. This, in my opinion, is best accomplished by correct splinting, with efficient extension and suspension of the limb, thus assisting in the nursing and comfort of the patient.

(3) The preservation of the mobility of the joints, which applies particularly to the joint immediately below the fracture. This joint should be moved at the earliest opportunity, that is, as soon as there is sufficient young callus round the fracture to prevent a recurrence of displacement while the joint is being moved. The object is not only to move the joint, but to stretch and periodically move the young fibrous tissue between the contiguous injured muscles, and progressively to extend the deep scar-tissue, which has become attached to the callus. The subjacent joint may have its ultimate movements restricted, but this is often dependent on the extent of the damage to the muscles and tissues surrounding the fracture, and the limitation will be more marked if the fibrous tissue heals matted together to the callus and bone. Also a better prognosis with regard to movements can be given, provided the joint has escaped damage at the time of the accident, as the fracture is situated farther away from the joint.

(4) The *gradual* restoration of the lost functions of the limb. A great number of these will reappear if the alignment has been correctly restored, and their return will be hastened by the judicious employment of massage, electricity, differential bathing, etc.

A fracture, from the point of view of treatment, must be considered not only as a solution of continuity of bone, but also as a lesion possibly affecting muscles, vessels, joints, ligaments, nerves, etc. The ideal treatment of a fracture should have for its object complete anatomical reposition of the injured tissues with complete restoration of functional power to the affected part. Our aim, therefore, in the treatment of every fracture should be to produce a limb in the most expeditious way as nearly as possible the equal of its fellow, both in function and in appearance.

THE KAHN TEST IN INDIA.

A Comparison with the Wassermann Reaction on 1,000 Cases.

By Major A. S. M. WINDER.
Royal Army Medical Corps.
AND
Assistant Surgeon N. A. MICHAEL.
Indian Medical Department.
(*From the Central Dermatological Laboratory, Poona.*)

In recent years many workers have attempted to produce a test for syphilis which would be simpler than the Wassermann reaction and which at the same time would give sufficiently reliable and accurate results.

The flocculation reactions seem to give the best likelihood of obtaining what is required, and several methods such as the Sachs-Georgi reaction and the Sigma test [1] have been devised. As this laboratory receives a large number of sera every week from all parts of India for the Wassermann test, it was considered a good opportunity to compare results obtained by the Wassermann test [2] with those given by a precipito-agglutination test [3] evolved by Dr. R. L. Kahn. The Kahn precipitation test is used largely in America and appears to fulfil these very important conditions, being simple to perform, quick, and giving accurate results. A special antigen is the only reagent required.

The routine method adopted for carrying out the Wassermann test was that described as No. 1 method in Medical Research Committees Report Series, No. 14.

For the Kahn test the technique [5] adopted was as follows :—

Beef heart muscle freed from fat and fibre was cut up finely into small pieces, spread on a porcelain slab and dried by means of an electric fan at room temperature. When quite dry the material was placed in a sterile mortar and ground into fine powder. Twenty-five grammes of this powdered muscle was then extracted with ether in the ice-box, shaking occasionally over a period of four days, the ether being changed once each day by filtration through paper.

Finally this ether extracted powder was spread over filter paper and allowed to dry at room temperature. The powder was then weighed, and to every gramme of powder five cubic centimetres of ninety-five per cent alcohol was added. The mixture was allowed to stand for ten days in the ice-box. After filtration 10·6 per cent of cholesterol was added.

Just before use the antigen is diluted with an equal quantity of normal saline solution.

The Test Proper.—Three small test tubes (3 inches × $\frac{3}{16}$ inch) were employed for each test, and into each was measured 0·05, 0·025 and 0·125 cubic centimetres of the dilute antigen, taking care that the antigen was placed at the bottom of each tube.

The patient's serum, after heating for thirty minutes in the water bath at 56° C., was then added, 0·15 cubic centimetre being placed in each tube. The tubes were then shaken vigorously for three minutes and placed in the water bath at 37° C. for one hour, when the readings were taken.

A heavy precipitation in one or more tubes was considered a strong positive result, a fine granulation in two tubes a positive result and a similar reaction in one tube only as "doubtful."

A preliminary reading was dispensed with as it did not seem to serve any useful purpose.

Since January, 1925, we have carried out the Kahn test on 1,000 cases, and the following is a summary of the series :—

COMPARISON OF THE WASSERMANN REACTION AND THE KAHN REACTION.

	Agree			Disagree				Agree	Disagree
	Positive	Negative	Partial	W+ K−	W− K+	W+ K±	W± K+		
S_1A	118	14	—	32	1	9	—	75·9	24·1
S_1P	94	194	4	68	—	15	4	77·0	23·0
S_2A	76	—	1	5	—	3	1	89·5	10·5
S_3A	33	—	—	2	1	3	—	84·6	15·4
S_3P	1	—	—	1	—	—	—	50·0	50·0
Non-venereal ..	—	84	—	—	—	—	—	100·0	—
Venereal sores ..	—	187	1	—	2	—	2	97·9	2·1
Congenital ..	1	—	—	—	—	—	—	100·0	—
Leprosy	8	18	2	4	1	—	1	82·4	17·6
Gonorrhœa ..	—	7	—	—	—	—	—	100·0	—
Others	—	—	—	1	—	1	—	—	100·0
Total	331	504	8	113	5	31	8	84·3	15·7

Total complete agreements, 843 = 84·3 per cent.
Total complete disagreements, 157 = 15·7 per cent.
S_1 S_2 S_3 = Syphilis, primary, secondary and tertiary.
A = Before treatment.
P = After treatment.

NOTES ON THE CASES IN WHICH THERE WAS DISAGREEMENT.

(1) S_1A. Wassermann positive, Kahn negative. Out of these thirty-two cases, twenty-seven were examined by the dark-ground method and *Treponema pallidum* was found in nine cases. The remaining five cases were diagnosed on a positive Wassermann test only.

One case was a second infection; *T. pallidum* was reported to be present the first time, and on the second occasion it was diagnosed when the serum gave a strong positive Wassermann reaction.

Wassermann positive, Kahn doubtful. Two cases were accepted as syphilitic by reason of the presence of *T. pallidum*, the remainder were diagnosed after the serum had given a positive Wassermann reaction.

(2) S_2A. The nine disagreements under this group had all well-marked secondary symptoms.

(3) S_3A. Four of these six cases complained of chronic pains in the

joints. The other two cases were described as suffering from destruction of the soft palate and chronic ulceration of the lower extremities.

(4) S_1P. Wassermann positive, Kahn negative. Forty cases out of the sixty-eight cases who have received regular treatment have given a persistent, strong, positive Wassermann reaction and a negative Kahn. After still further treatment fourteen of these cases have become negative to both tests.

Wassermann positive, Kahn doubtful. In thirteen of these cases the Wassermann reaction has always been positive in spite of treatment.

Leprosy. These cases were sent up with a view to eliminating syphilis. They were all advanced cases of leprosy, and as many Indians of this class suffer from both diseases, it was thought likely that those that gave a positive Wassermann reaction would show some improvement when given antisyphilitic treatment.

Conclusions.

From the above analysis it will be seen that there was complete agreement in 843 cases (84·3 per cent of the total) and some disagreement in 157 (15·7 per cent).

The Kahn test is therefore a useful and accurate one, especially in untreated cases, when compared with the Wassermann reaction, and can be carried out with little apparatus and at a small cost.

A slight degree of sepsis does not influence the reaction, and on several occasions it has been possible to check a doubtful Wassermann positive result by means of the Kahn test. This is important in a warm country like India where distances are great and where specimens are often a week or more in the post before they are tested.

Several cases in which the serum was so anticomplementary that the Wassermann test failed, gave strong positive reactions by the Kahn test, which were fully justified clinically at a later date.

The Kahn test requires a larger quantity of serum. This is a point that is often forgotten when discussing its utility, and is an important one judging from the very small specimens of sera received in this laboratory, sometimes even hardly sufficient to carry out the Wassermann test.

Cases that have received thorough and prolonged treatment with arsenical and mercurial preparations become negative earlier with the Kahn reaction than with the Wassermann test, according to our experience, and for this reason it is probably safer to depend on the Wassermann results as far as prognosis and treatment are concerned than on the results obtained by the Kahn test.

References.

[1] Dreyer and Ward. *Lancet*, 1921, i, 956.
[2] Osmond and McClean. *Brit. Med. Journ.*, 1924, iv, 617.
[3] Kahn. *Arch. Derm. u. Syph.*, May, 1922, v, 570.
[4] *Idem.* *Journ. Amer. Med. Assoc.*, lxxxi, 2, p. 88.
[5] Kahn and Wile. *Ibid.*, September, 1922, lxxix, 870.

THE VALUE OF RENAL FUNCTION TESTS IN CLINICAL MEDICINE.[1]

By Lieut.-Colonel W. K. BEAMAN, D.S.O.
Royal Army Medical Corps (Retired Pay).

The trend of medical research to-day is towards the study of function in the living subject in health and disease rather than the study of merely pathological material. I feel that it is to the biochemist that we are to look for further advances in the art of medicine, and that in time the art will approximate more nearly to a science.

The pathologists have given us tests which have revolutionized clinical medicine; to mention only a few: the Wassermann reaction, Widal's reaction, and the identification of the tubercle bacillus in sputum. There are many other tests which are most helpful, but perhaps not quite so certain. The biochemist is following on, and is perfecting tests of function that in time will be almost if not quite as indispensable as those tests I have mentioned.

The pathologist has tended to retire more and more into his laboratory aloof from clinical medicine, owing in a great measure to the lack of helpful co-operation on the part of the clinicians. The ultra-modern doctor, ignoring the clinical side, expects the laboratory to do all his work for him, and seems to consider the proper equipment for a doctor to be a hypodermic syringe and a few test tubes. The ultra-conservative clinician, on the other hand, ignores the pathologist. "A murrain," says he, "on the biochemist and all his gimcrack tests; give me a stethoscope and my ten digits and all is well."

Between these groups the pathologist has been starved clinically. It is often forgotten that full clinical details, in addition to being of intense interest to the pathologist, are often essential if he is to arrive at a correct interpretation of his findings. Now, while the pathologist has been able to carry on and help us without our help in return, the biochemist cannot do so as interpretation of findings is so dependent upon associated clinical observations. My object in this paper is to put before you the possibilities of one biochemical test, and to beg your interest in a more or less new branch of medicine, and to ask you to remember that the biochemist and the clinician must go forward hand in hand if the great possibilities of the new work are to be perfected. In the great teaching centres this co-operation is accomplished by teams or units where the biochemist, himself a clinician, sees the cases, and also has the assistance of most skilled physicians and surgeons in correlating biochemical observations

[1] Paper read before the Newport Medical Society, January 27, 1926.

with clinical findings. Here in the provinces we have all got to be members of the team if we are to get results.

Now, after this rather uncalled-for preamble, I will proceed to the subject matter of my paper.

Renal function has been measured, or I should say that attempts have been made to measure it in various ways. The functioning of the kidney is a subtle business, and we are not perhaps always sure what function or part of a function we are measuring. There are, however, several tests which are of vital importance, and which give most valuable information when taken in conjunction with the clinical aspects of the case. The surgically-minded will all know the tests for permeability of the kidney necessarily undertaken to implicate the diseased kidney before excision. One of these tests depends upon the excretion of a dye which can be easily distinguished in the urine withdrawn from each ureter separately. This test is invaluable but is of supreme importance only to the surgeon and perhaps incidentally to his patient. We have the rough tests which we have all used for years, and which are still essential—I mean the routine examination of the urine—its specific gravity, the presence of protein, sugar, pus and blood. Nowadays these essential tests are only preliminaries, and if any variation from the normal be found we must proceed to one or other of the more modern tests of function. Considerable work has been done on the blood, and while blood-tests are on the whole more accurate and occasionally essential, it has been found that almost as much information is obtainable from the urine as from the blood. The blood-tests too are more complicated, require more elaborate apparatus and demand more skill on the part of the investigator. The test on which I place most reliance, and of which I have most experience, is the urea concentration test. This test was launched by Professor McClean, and most valuable results were achieved. Recently a modification has been put forward by Calvert, of St. Mary's Hospital, and it is this modification which I practise, and which I claim to be of such great assistance in diagnosis and prognosis, and to have such a wide sphere of application. As I proceed you will perceive how wide the application is, and how essential is the collaboration between the biochemist and the clinician. Broadly speaking, the test is useful :—

(1) In surgical cases.
(2) In obstetric cases.
(3) In medical cases.

(1) Surgical Cases.

Here the test is of assistance in two ways. First, suppose a case of damaged kidney, pyonephrosis, tuberculosis or other unilateral lesion. You first of all implicate the offending kidney by a dye test. Now the question arises, "Is the other kidney sufficient to support life?" The function test will give you the answer.

Now take the second group. This group comprises cases of obstruction to the flow of urine best exemplified by cases of enlarged prostate. Here the test is of the very greatest value, in many cases it is essential and determines the possibility or otherwise of prostatectomy.

In all such cases a renal function test should be performed, and where the function is found to be seriously impaired a preliminary suprapubic drainage should be done, and after the lapse of ten days or so a second function test will often show that the kidney function has improved sufficiently to allow the prostatectomy. I wish to mention here that in these cases of obstruction to the flow of urine, the blood urea or the total non-protein nitrogen of the blood gives rather more satisfactory results than the urea concentration tests. Why it is so I do not know; that is one of the subtleties of the renal function which I mentioned in my preamble.

(2) Obstetric Cases.

These cases are most interesting. An enormous amount of work has been done recently and a great deal remains to be done, but the renal function test furnishes one certain definite and compelling indication.

We may divide our obstetric cases roughly into three classes :—

(1) *Simple Albuminuria of Pregnancy with or without Symptoms.*—Here the renal function is unimpaired or little impaired, as shown by this test. I am not sure whether Calvert's method will show more than McClean's original method, as I have not had the opportunity of performing the test in these cases and other observers have used McClean's original method.

(2) *True Nephritis complicated by Pregnancy.*—By expressing myself in this way I am treading on rather debatable ground and am allying myself with those who deny the existence of a true renal toxæmia of pregnancy. Whichever view you take, the group is a most important one, and the point of view is immaterial to my purpose to-night, as in my second class I wish to include cases of severe renal toxæmia if such exist.

In these cases the test shows definite impairment of renal function, and in such cases, unless there are very strong reasons against such a course, pregnancy should be terminated, as if allowed to go to term the renal disease becomes rapidly worse and often the fœtus dies *in utero.*

(3) *Pre-eclamptic and Eclamptic Conditions.*—Whilst in eclampsia the renal function is usually found to be impaired, the test is unnecessary. In the pre-eclamptic state the renal function usually shows no impairment, and we have to rely on other tests such as blood-pressure observations and especially upon the test of liver function.

(3) Medical Cases.

It is here that I claim the greatest value for the test to the general practitioner. It is of value in diagnosis and prognosis in the following types of case :—

(1) *Nephritis.*—In acute nephritis at first renal function is practically in abeyance. As the patient recovers the state of the renal function may be ascertained and the stages watched. If permanent damage to the kidney persists the extent of the damage and the type of the lesion may be worked out.

In chronic nephritis the test distinguishes clearly between the so-called parenchymatous or hydræmic nephritis and the chronic interstitial type of nephritis.

(2) *Hyperpiesia.*—The test clearly distinguishes this condition from chronic interstitial nephritis. Personally I feel that if the test did no more than this it would deserve the attention of every practitioner, as without this test I find it often very difficult to make a diagnosis in these cases, and the diagnosis is so important both from the point of view of treatment and prognosis.

(3) Functional or orthostatic albuminuria may be distinguished from nephritis.

(4) It is useful in the differential diagnosis of cases of ascites and œdema when seen late. Recently I saw two cases of ascites and the test in each case reversed the diagnosis, and the new diagnosis was upheld by the clinical course of the disease.

Now for the test itself. It consists essentially in giving fifteen grammes of urea and obtaining later as concentrated a specimen of urine as possible. Then a quantity of fluid is given and as dilute a specimen as possible is obtained. The urea in these two specimens is estimated and the difference between the two readings, that is, the range of urea concentration, constitutes the criterion of efficiency. In efficient kidneys this range is always over two per cent and usually about three per cent.

This test is little trouble to the practitioner, little trouble to the patient, and very little trouble in the laboratory.

Here are the instructions I give to the patient:—

(1) Do not eat or drink anything after 6 p.m.

(2) Empty the bladder at 10 p.m., keep a specimen, mark it A.

(3) Then drink the medicine given.

(4) Empty the bladder one hour later, i.e., at 11 p.m. and throw the water away.

(5) Keep all water passed between 11 p.m. and 7 a.m., measure it, save a specimen and mark it B.

(6) Between 7 a.m. and 8 a.m. drink slowly two pints of fluid such as weak tea, water, barley water, etc. Keep all water passed between 7 a.m. and 9 a.m., emptying the bladder at 9 a.m., measure it, keep a specimen and mark it C.

(7) Send note of amounts of water passed and the specimens A, B, C, for examination.

B and C specimens are used for the test proper; I use A for the routine examination, protein, pus, blood, etc.

Now for results. Calvert gives the following figures as typical findings :—

	B.	C.	
Normal	3·82	0·40	urea per cent
Parenchymatous (hydræmic) ..	2·60	2·40	,, ,,
Ch. Interstitial (azotæmic) ..	1·32	1·12	,, ,,
Hyperpiesis	4·40	0·90	,, ,,

You will see from these figures that there is a very definite type of reading for each type of disease.

In the normal the concentrating power is high, i.e., over three per cent and the range of concentration is also high.

In the hydræmic type the concentrating power is also quite good, but the range is negligible.

In the azotæmic type the concentrating power is poor, and again the range is negligible.

In hyperpiesis the type of reading obtained is normal, but tends if anything to be rather exaggerated.

Now I will show you some results of tests carried out by me during the past twelve months; you will see that Calvert's findings are followed very closely.

Chronic hydræmic nephritis :—

(B) Sp. gr.	1020	Urea per cent	2·90
(C) ,, ...	1020	,, ,, ...	2·70

Blood-pressure.—Systolic, 195; diastolic, 105. Urine contained protein but very few casts.

Chronic interstitial nephritis :—

(B) Sp. gr.	1010	Urea per cent	0·90
(C) ,, ...	1009	,, ,, ...	0·85

Blood-pressure.—Systolic, 225; diastolic, 135. Died three months later from renal failure.

Pure hyperpiesis :—

(B)	3·40 per cent urea
(C)	0·50 ,, ,,

Died about six weeks later from a stroke.

Hyperpiesis with some cardiac hypertrophy :—

(B) Sp. gr.	1023	Urea per cent	4·10
(C) ,, ...	1006	,, ,, ...	1·40

Blood-pressure —Systolic, 205; diastolic, 120. Only symptom was epistaxis.

Double renal calculus :—

(B) Sp. gr.	1010	Urea per cent	1·25
(C) ,, ...	1009	,, ,, ...	1·15

Blood-pressure.—Normal. Trace of albumin, few pus cells, no blood.

Case of albuminuria :—

(B) Sp. gr.	1020	Urea per cent	3·50
(C) ,, ...	1004	,, ,, ...	0·60

Blood-pressure.—Systolic, 115; diastolic, 75. Renal function normal. Not nephritis.

Two cases of ascites :—

(1)	(B)	2·45 per cent urea
	(C)	0·80 ,, ,,
(2)	(B)	3·15 ,, ,,
	(C)	3·15 ,, ,,

The first of these cases had been diagnosed nephritis and the second cirrhosis! As this test plainly showed, the diagnosis was wrong in each case. The former is either an unusually chronic case of cirrhosis or chronic peritonitis. The second case died with uræmic symptoms.

Two cases of hæmaturia.

(1) Hæmaturia with albumin and pus—

(B)	3·50 per cent urea
(C)	0·60 ,, ,,

This is probably a unilateral renal lesion. Diagnosis not yet settled.

(2) Hæmaturia—

(B)	2·25 per cent urea
(C)	0·85 ,, ,,

This was obviously not nephritis. It later turned out to be carcinoma of the bladder.

Now, finally, I have a confession to make. One does not always obtain such clear-cut typical findings as those I have shown, and the reading of results in such cases is sometimes difficult. The atypical readings given in definite cases of nephritis during the transition stage are easy enough when one has a good clinical history. Difficulty arises in cases of heart failure and in vague undiagnosed cases of illness where the kidney is possibly the offender. Here I think there is a future for this test. I am not yet certain whether one can obtain any useful information as to the state of the kidneys in a condition of heart failure. I have not yet investigated a sufficient number of cases to give an opinion, though if one could obtain reliable evidence of the renal condition in such cases it would be of considerable assistance.

Calvert says that in cardiac failure, "the B and C values are raised, and that their approximation varies directly as the degree of heart failure." If this is the last word the test is not going to help us much here.

I will just show you a few charts from cases such as I have mentioned, and which I cannot read at present, but which I hope to be able to read later on, as I intend to try out the test thoroughly in this type of case. I hope that by close clinical observation, and perhaps by the addition of another function test, these atypical findings will be capable of a rational translation and help one to a diagnosis.

(1) A case where the only diagnosis so far has been "debility." This man gives a history of certain attacks which suggested the possibility of some renal lesion. He also gave a history of urethral stricture which had to be dilated. Urine except for the fixed specific gravity is normal. A catheter specimen was sterile. Blood-pressure is normal.

Range of function test:—

(B)	Sp. gr.	1014	Urea per cent	1·72
(C)	„	1012	„ „	1·62

There is obviously impaired renal function possibly due to back pressure at the time of the stricture; there may be dilated renal pelvis not quite amounting to a hydronephrosis.

(2) A case of recovering cardiac failure. (Aortic disease.)

Range of function test:—

(B)	Sp. gr.	1012	Urea per cent	1·92
(C)	„	1010	„ „	1·70

Blood-pressure.—170/70.

I suspect renal disease of interstitial type, but am not yet sure.

(3) A case of œdema and ascites. Blood-pressure.—160/90.

Range of function test:—

(B)	Sp. gr.	1030	Urea per cent	4·26
(C)	„	1040	„ „	3·05

No albumin, sugar, casts, pus, or blood.

Clinically I took this case for an ordinary chronic hydræmic nephritis. I am now inclined to look upon it as a case of hyperpiesia with cardiac defect.

All the above cases are still under observation.

REFERENCES.

[1] Calvert. "Diagnosis and Prognosis in Chronic Renal Disease," *Brit. Med. Journ.*, January 10, 1925.

[2] Hugh Maclean. "Modern Methods in the Diagnosis and Treatment of Renal Disease."

[3] De Wesselow and Wyatt. "Modern Views on the Toxæmias of Pregnancy."

[4] Comyns Berkeley, Dodds and Walker. "Chemical Observations on the Toxæmias of Pregnancy," *Journ. Obstet. and Gynæcol. of Brit. Empire*, vol. xxxi, 1924.

[5] Beaumont and Dodds. "Recent Advances in Medicine," Second Edition.

ACRIFLAVINE IN THE TREATMENT OF CHRONIC AMŒBIC DYSENTERY.

By Major A. J. van der SPUY.
South African Medical Corps.

Entamœba histolytica is no doubt the most dangerous of all the intestinal protozoa of man, being the cause of amœbic dysentery, dysenteric stricture of the bowel and hepatic abscess. The results of treatment of acute amœbic dysentery by means of emetine have been exceedingly brilliant, to the extent that this drug is regarded as a "specific" for this condition. Nevertheless, that emetine does not cure every case is well known, and Stitt even states that there is a question as to the possibility of the emetine treatment acting as a factor for the increase of carriers. At the present time statistics indicate that twenty per cent of acute cases become chronic "carriers," who are potential sources for the outbreak of fresh infection. This high percentage of carriers obviously constitutes a great danger to the community, and consequently a cause for anxiety to the Public Health Authorities. The eradication of this focus of infection, therefore, becomes a matter of primary importance in preventive medicine, and every effort should be made to free a patient of amœbæ and their cysts before he is allowed to resume a normal life in a community and regarded as cured. To achieve this object various forms of treatment from drugs by the mouth to excision of the large bowel have been tried, all, unfortunately, with results lacking in uniformity and often without any benefit to the patient. Emetine-bismuth-iodide has been highly recommended as our best agent for the elimination of *E. histolytica* cysts of carriers, but whether a permanent cure can always be obtained is still undecided. Certain it is that the emetic and purgative properties of the drug require a determined mind to continue the treatment. Even "bismetine," a double iodide of emetine and bismuth in a gluten-coated capsule, which allows the drug to be set free only on reaching the intestine, has not deprived this form of treatment of its unpleasant features. Appendicostomy, followed by daily colonic lavage with different solutions, e.g., normal saline, boric acid, tannic acid, salicylic acid, quinine, protargol, eucalyptus, etc., has demonstrated marked improvement in the clinical condition, irrespective of the bacteriological condition of the patient. In acriflavine solution, however, it would seem that we possess a drug, which, if not actually a specific in chronic amœbic dysentery, is at least one that deserves a foremost place in the treatment of a carrier of this disease. My attention was first directed to the value of this drug in the treatment of amœbiasis in 1917 (see Case 1). Since then further opportunity to follow up the idea did not present itself until recently, and, whilst the

number of cases treated with acriflavine is limited, the results obtained are considered sufficiently encouraging to warrant recording. It will be noticed that Cases 2 and 4, the only two available for examination, gave ten consecutive negative bacteriological examinations each, and may therefore be regarded as cured, after years of suffering and energetic treatment prior to appendicostomy and instillations of acriflavine. By means of this latter treatment it would appear that a cure could be affected within a period of one month, and a patient need not be confined to bed or hospital for that period.

Treatment.—Appendicostomy is performed through a "grid-iron" incision and a No. 10 or 12 rubber catheter is fixed in the appendix by means of a catgut suture. On the morning of the fourth day colonic irrigations are commenced as follows: The large bowel is thoroughly washed out with tepid water through the appendix. The patient then assumes the dorsal decubitus in bed or on a sofa, and half a pint to a pint of 1 in 5,000 acriflavine solution (in water) is run into the bowel. The dressings are replaced and the patient remains in this position for three-quarters of an hour, after which he is allowed to get up and go about for the rest of the day. The same routine in treatment is practised in the evening prior to retiring for the night. On every third or fourth day of treatment one instillation of half a pint of five per cent zinc sulphate solution is substituted for the acriflavine solution. This solution may cause a burning sensation in the abdomen, but this passes off in about two hours' time. After ten or twelve days the treatment is suspended and a record of the number of motions per day kept. A bacteriological examination of the stool may then be carried out, and as often thereafter as is considered necessary.

No restrictions in diet were imposed, nor was alcohol forbidden. In this connexion it might be mentioned that Case 3 took a big overdose of alcohol (his own prescription) prior to discharge from hospital and suffered apparently no ill-effects so far as his dysenteric symptoms were concerned. None of the patients complained of any unpleasant symptoms nor exhibited any unfavourable signs as the result of the instillation of the acriflavine.

Case 1.—Serjt. L., aged 22. Admitted to the South African Military Hospital, Richmond Park, Surrey, on September 9, 1917, suffering from a large hepatic abscess pointing on the inferior aspect of the left lobe of the liver. (In April, 1916, he contracted amœbic dysentery in East Africa, and had a recurrence of this condition after discharge from hospital.) Emetine one-third grain hypodermically daily was prescribed.

September 18: As the general condition of the patient appeared worse, laparotomy was performed. The wall of the abscess was adherent to the parietal peritoneum and was not separated. The abscess was evacuated, the cavity swabbed with flavine solution (strength unknown), a little of the solution left in the cavity, and the wound closed in layers without drainage.

September 28: Stitches were removed. The wound was soundly healed.

October 28: Discharged to duty. Six months later this patient was still on duty apparently quite fit, but his subsequent history could not be traced.

Case 2.—Pte. v. S., aged 31. Admitted to Military Hospital, Wynberg, on April 6, 1923, suffering from large hydatid cyst of the liver. After operation he made an uninterrupted recovery, and returned to duty on June 20. On July 30, he was re-admitted complaining of abdominal pain, diarrhœa, tenesmus, and the passing of blood and mucus. He looked ill and had from five to eleven motions of the bowels per day. Temperature 97° F., pulse 80. *E. histolytica* were found present in the fæces. Emetine, one-third grain hypodermically daily, was given for twelve days. After missing one day a further course of emetine, one grain daily, was given for twelve days. As his bowels moved then once per day only and the other clinical symptoms had disappeared, treatment was discontinued and he returned to duty on September 1. On September 24 he was re-admitted, looking very ill and complaining of a return of all his old symptoms of dysentery. Temperature 100° F., pulse 102. During the first days in hospital his bowels moved fourteen times. Emetine one grain daily was prescribed. After nine injections all symptoms had disappeared, and treatment was discontinued for six days. After that he had four further courses of ten injections, each combined with pulv. ipecac. co. ten grains twice daily by the mouth. By the end of January, 1924, the bowels still moved from four to six times per day, while some blood and mucus were also passed. *E. histolytica* were still present. In May, 1924, daily colonic wash-outs with eucalyptus were tried with apparently no benefit after a month's trial. On January 25, 1924, *E. histolytica* were found in fæces. On June 2, *E. histolytica* found present in fæces. On June 23, the bowels moving from six to ten times per day, a further course of ten injections of emetine, one grain each, was commenced. This had apparently no influence on the symptoms. On July 11, appendicostomy was performed. The caput cæcum and ascending colon showed marked hypertrophy, while the appendix itself was completely occluded except for a short length at its junction with the bowel. The catheter was therefore inserted into the caput cæcum.

Treatment.—July 15, 1924: Irrigation twice daily with protargol solution commenced.

July 30: The wash-outs were discontinued.

August 10: The bowels are moving from four to eight times per day.

August 15: Treatment with acriflavine commenced.

August 17: No motion between the wash-outs.

August 25: Treatment discontinued.

August 30: Bowels are moving on an average of five times per day.

September 10: Treatment recommenced and zinc sulphate solution substituted as described above.

September 20: Bowels moving once between wash-outs. Treatment discontinued.

September 25: Bowels moving once per day.

November 30: One or two motions per day.

January 31, 1925: Patient has grown fat and well. Discharged from hospital.

August 12: Examination of fæces. No parasites, or red blood-corpuscles, pus or other cells were found.

September 1: Appendicostomy closed. Healed by primary union.

September 14: "No parasites or cells were found."

September 15: "No parasites or cells were found on microscopic examination."

September 16: "No parasites or cells were found."

September 17: "No parasites or cells were found."

September 18: "On microscopic examination no parasites or cells were found."

September 19: "No parasites or cells were found."

September 21: "On microscopic examination no parasites or cells were found."

September 22: "No parasites or cells were found."

September 23: "No parasites or cells were found."

September 24: "On microscopic examination no parasites or cells of any kind were found."

Case 3.—Bdr. D., aged 32. Admitted to Military Hospital, Wynberg, on January 14, 1925, complaining of diarrhœa, together with the passage of blood and mucus. He first contracted amœbic dysentery in Palestine in 1918, and was transferred to London, where he remained under treatment for about a year. He stated that he had emetine hypodermically and "powders" by the mouth. He has, however, never been free of dysenteric symptoms. On admission pulse and temperature were normal. The bowels moved four or five times per diem, and contained blood and mucus.

January 22: *E. histolytica* found present in fæces.

January 30: Appendicostomy was performed.

February 3: Instillations of acriflavine and zinc sulphate commenced. From this date to February 19 bowels did not move between irrigations, which were then discontinued. Weight 136 pounds. From February 20th to 24th bowels moved twice per day, but no blood or mucus was present. A further course of irrigations was prescribed for six days; thereafter discontinued.

On February 18, weight 144 pounds.

On March 28, microscopic examination showed no amœbæ, red blood-corpuscles or pus cells in the fæces.

April 15: Weight 146¾ pounds.

May 13: Microscopic examination of fæces was negative.

On June 16, appendix removed and incision closed without drainage. He made an uninterrupted recovery.

Discharged on July 7, bowels moving once per day.

This patient did not report for further bacteriological examination as instructed, and his whereabouts could not be traced.

Case 4.—Trooper W., aged 24, was admitted to the Military Hospital, Wynberg, on May 20, 1922, complaining of dysentery contracted in the East African Campaign in 1917, when he was under treatment for six months. Bowels acted on an average five times a day, and contained blood and mucus.

June 1 : *E. histolytica* were found present in the stools.

June 27 : Emetine one grain hypodermically commenced.

July 9 : Emetine discontinued.

July 10 : A further course of emetine hypodermically commenced.

July 22 : Treatment discontinued.

August 15 : *E. histolytica* found present in fæces. Bowels acting on an average six times per day.

August 16 : Emetine, one grain hypodermically ; pulv. ipecac. co. ten grains three times a day.

September 12 : Practically no improvement.

December 7 : No blood or mucus for the last two months. Still has on an average five motions per day. Discharged from hospital. During 1923 he was in another hospital for treatment of dysentery and fibrous structure of the large bowel. End-to-end anastomosis was performed.

September 4, 1924 : He was re-admitted to the Military Hospital, Wynberg, complaining of passing of blood and mucus and diarrhœa, his bowels moving on an average of five times per day. Bacteriological examination of fæces showed *E. histolytica* present.

Emetine, one grain daily was commenced. After a month's treatment there was apparently no improvement in the clinical condition.

January 10, 1925 : Appendicostomy was performed.

January 14 : Acriflavine treatment was commenced.

January 24 : Bowels acting once per day, between the wash-outs. Weight 153 pounds. Wash-outs discontinued.

February 10 : Weight 158 pounds. Bowels acting once per day.

February 27 : Weight 160½ pounds. Bowels acting once or twice per day.

March 11 : No amœbæ found present in the fæces.

May 13 : No amœbæ or cysts found present in the fæces.

June 27 : The appendix was removed and the wound closed without drainage.

July 7 : Stitches removed. The wound is soundly healed.

August 6 : No *E. histolytica* found in fæces.

August 21 : No amœbæ or red blood-corpuscles were found. Discharged from hospital, the bowels moving once per day.

September 19 : "No parasites or cells were noted."

September 21 : "No parasites or cells were noted."

September 22 : "No parasites or cells were found present."
September 23 : "No *E. histolytica* found present."
September 24 : "No *E. histolytica* found present."
September 25 : "No *E. histolytica* cysts found present."
September 26 : "No *E. histolytica* cysts found present."
September 28 : "No *E. histolytica* cysts found present."
September 29 : "No *E. histolytica* cysts found present."
September 30 : "No *E. histolytica* or cysts found present."

In the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS of September, 1925, Dr. P. Manson-Bahr, in discussing research on amœbiasis, states :

"Improvement in our methods of treating the chronic, or 'cyst passer' stage of the disease is urgently required. The introduction of a drug which possesses none of the disagreeable attributes or sequelæ of emetine and its compounds is a desideratum."

It is hoped that these notes may help to open up a line of research in the treatment of a carrier of amœbic dysentery, and may be of assistance to my colleagues who are working in countries where this disease is prevalent.

In conclusion, I have to thank Colonel Sir Edward Thornton, K.B.E., D.M.S., Union Defence Forces, for permission to publish these notes. The operative treatment in connexion with Cases 2, 3 and 4 was carried out by Lieutenant-Colonel T. Lindsay Sandes, O.B.E., Consulting Surgeon to the Military Hospital, Wynberg, Cape Town.

———

"ROUTINE PATHOLOGICAL EXAMINATION AS APPLIED TO PHYSIOLOGICALLY INEFFICIENT AVIATORS.[1]

By Wing-Commander H. E. WHITTINGHAM, M.B., D.P.H., D.T.M. & H.
Director of Pathology, Royal Air Force.

The diseases that affect aviators are the same as those from which the rest of mankind are liable to suffer. There are no special diseases of the air, but flying may strain the physiological functions of the body in various ways—thus, briefly, the general alertness required uses up much nervous energy, and high altitudes accelerate the rate of breathing and the circulation, producing changes in the whole metabolism. This strain may be the direct cause of a pilot becoming physiologically inefficient, but, on the other hand, the cause may be some active disease or its aftermath.

It has been aptly stated that pathology is physiology gone wrong. This is perhaps the best conception of what the term disease means, and it forms a satisfactory basis on which to build up a routine pathological examination for aviators. There is no sharp line of demarcation between physiological and pathological tests, the one set merges into the other; by the former we seek to ascertain whether the individual is normal, by the latter we try to detect any abnormality and the cause. The aerodrome medical officer employing standard tests is able to detect physiological defects in a man, who is then passed on to the pathologist to investigate the cause.

In the Royal Air Force the flying personnel are systematically kept under physiological observation, and every year all officers are tested for physical fitness in conjunction with their annual report. Thus any abnormalities that have developed during the previous twelve months are detected and, unless the condition can be remedied at the station, the case is sent before a special medical board. In this country the Central Medical Board, at Hampstead, deals with these cases and also with all aviation candidates. If the Board decides that any case is physiologically inefficient or doubtful, specialists perform further tests to detect, if possible, the cause, and to aid in the assessment of the probable duration of the disability. A routine pathological examination is carried out in most cases, and physiological and pathological findings are correlated.

Routine Pathological Examination.

Gradually having gained knowledge from our mistakes, the present scheme has been adopted for all cases sent for pathological examination. The procedure may seem lengthy, but the results have justified its use. The scheme has the following advantages:—

[1] A paper read at the Brighton and Hove Congress of the Society of Public Health.

(1) The laboratory personnel know exactly what tests to prepare for and carry out.

(2) The time spent on negative tests is not wasted, as these cases act as controls for the positives.

(3) The pathologist, with this comprehensive report before him, is frequently in a position to give a decided opinion on each case.

(4) The patient is saved the trouble and expense of returning for further tests, and, in doubtful cases where the Board wish to know whether admission to hospital is advisable or not, a decision can be given before the patient leaves the laboratory.

Scheme of Routine Pathological Examination.

Blood Tests ..	Counts.	Red blood-corpuscles per cubic millimetre.	
		Hæmoglobin percentage.	
		Colour index.	
		White blood-corpuscles per cubic millimetre.	
		Differential leucocyte count (400 cells).	
		Examination for parasites.	
	Culture.		
	Agglutination against		*B. typhosus.*
			B. paratyphosus A, B and C.
			B. enteritidis Gaertner.
			B. dysenteriæ Shiga.
			B. dysenteriæ Flexner.
			M. melitensis.
			M. paramelitensis.
	Wassermann and Sigma.		
	Hæmagglutinins.		
	Blood urea.		
Urine Tests ..	Routine.	Specially examined for	albumin
			blood
			pus
			sugar
			casts
			ova of *Bilharzia*
			T.B. and other pathogenic bacteria.
	Renal efficiency tests.		
Fæces	For pathogenic bacterial, protozoal, or helminthic infection.		
Sputum	If available.		
Throat Swabs and Peridental Smears if any indication of oral sepsis.			

Procedure for Carrying out Tests.

The tests are carried out at a definite hour of the day, namely 10 a.m., the object of this being to render the results of all examinations comparable. This point will be appreciated when it is recollected that certain physiological processes vary with the time of day, and when these processes are abnormal the variation may be greater. For example, the period of time

that has elapsed since the last meal will materially affect the total leucocyte count and the urea excretion.

The renal efficiency tests, occupying as they do the period of two hours, have to be started first. The patient is instructed to empty his bladder into a sterile flask, and this urine is used for the complete routine examination. Thereafter the urea meal is administered, and as further specimens of urine have to be collected at hourly intervals for the next two hours, there is plenty of time to carry out the remaining tests.

The patient is now given a history form to fill in, to supply particulars required for record purposes, and to aid in the interpretation of the results of certain tests. For example, the date of protective T.A.B. inoculation affects the agglutination test, and in the case of patients who have recently done much high flying an increased red blood count must be allowed for.

The blood count and hæmagglutinin tests are then proceeded with, but the collection of blood for Wassermann test, agglutination and culture is delayed until the end of the second hour, when the vein is punctured to obtain blood for the estimation of its urea content.

By the end of two hours all the tests have been collected and many of them completed. In fact, it is almost as easy to deal with a batch of four to six patients as it is to do one.

The results of the tests are recorded on forms designed to reduce clerking to a minimum. A sample of the blood report form is shown:—

Report No. Form 3212.

ROYAL AIR FORCE.

Name (in full) ....Rank...............M.O. i/c Case........................

Hospital or Unit...Age..................

Specimen of BLOOD FOR COMPLETE ROUTINE EXAMINATION.

Date and hour of collection	
Temperature	° F.
Red blood-corpuscles	per c.mm.
Hæmoglobin	per cent
Colour index...	
White blood-corpuscles	per c.mm.

DIFFERENTIAL LEUCOCYTE COUNT (400 cells counted).

Small mononuclear lymphocytes	per cent non-granular.
Large mononuclear lymphocytes	
Hyalines..	
Transitionals	per cent granular.
Neutrophil polymorph. leucocytes	
Eosinophil polymorph. leucocytes	
Basophil polymorph. leucocytes	

BLOOD PARASITES.

BLOOD CULTURES.

WASSERMANN REACTION.

Agglutination Test. Garrow's Method. Time 10 minutes.

Organisms.	Dilution of serum 1/10	1/50	1/100
B. typhosus			
B. paratyphosus A			
B. paratyphosus B			
B. paratyphosus C			
B. enteritidis Gaertner ..			
B. dysenteriæ Shiga			
B. dysenteriæ Flexner ..			
B. melitensis			
B. paramelitensis			

Conclusions.

Wing Commander, R.A.F.M.S.
Director of Pathology,
R.A.F. Path. Laboratory.

Halton Camp.
Date..................

Remarks of the Tests.

Blood Counts.—These are collected from the thumb, as blood obtained from the lobe of the ear gives varied and erroneous results, due to the tendency of the circulation to stagnate in the latter situation, especially during the cold weather.

The normal red blood-corpuscle count is accepted as six millions per cubic millimetre for all aviators under 30 years of age. Above that age five and a half or five millions per cubic millimetre may be taken as normal, depending on the history of the case.

A rapid, simple and efficient method of staining is employed. A 0·5 per cent solution of Leishman stain in methyl alcohol is used. The stain is kept in a stoppered cylindrical staining jar of sufficient size to receive at least four slides. By placing the slides in the pot in pairs, back to back, four slides can be stained at the same time. The specimens are left in this stain for five minutes, then rapidly washed in distilled water, allowed to dry in the air and are now ready for examination. The same stain may be used for hundreds of slides provided the pot is well stoppered. This method of staining prevents the appearance of artefacts derived from the distilled water, lessens the chance of deposit and saves much time.

For the differential count four hundred cells are counted, and the following seven types of cells are recognized :—

Small mononuclear lymphocytes.
Large mononuclear lymphocytes.
Hyalines.
Transitionals.
Neutrophil polymorphonuclear leucocytes.
Eosinophil polymorphonuclear leucocytes.
Basophil polymorphonuclear leucocytes.

This division has been found adequate for all the information required from a blood count. Many medical men are very dubious of the value of differential counts, but in the hands of careful workers, knowing their own

nformation may be given which may point to
rect the line of further investigation.
› be expected, the blood culture is in most cases
ıs a routine test is justified by its value in the
ere correct and immediate treatment is of vital
:curred in which its use had been omitted, and
ılt could probably have been found; the after
ısizes the necessity for routine blood culture.
The routine agglutination test is carried out
he following dilutions: 1/10, 1/50 and 1/100.
ıgs by this method are controlled by Dreyer's

› being of value in detecting evidence of present
e organisms tested for, acts as a check on the
T.A.B.C. vaccine in use.
z Tests.—The Wassermann test is performed by
ıethod and is found very reliable. The Sigma
ı all cases for the past three years. It has given
is more simple in practice, but until consider-
nere is some difficulty in deciding on the degree
infected sera tend to give a fictitious positive
ı history of syphilis, a reading of less than four
ed as positive. In such a doubtful case, it is
: into the personal history, a procedure which is
any a patient. However, these defects are no
ed with the Wassermann test, which tends to
of positive cases and gives at times considerable
complement doses, owing to defective comple-
eeping guinea-pigs during the hot weather in
supply of complement a difficult problem. It is
gma test has been adopted in our routine work

ng the present year the group hæmagglutinins
cases. It is hoped in the near future to extend
nnel. The knowledge of the group hæmagglu-
:e crash is of great value. Moreover, by doing a
ion on all available personnel, we have a rapid
blood donors. For instance, if the Wassermann
on suspected syphilitics, the suitability of the
ery dubious. Similarly, a would-be donor, who
might have no history of malaria and yet show
ı blood.
l urea is determined by the method of MacLean
is one of the most valuable tests in modern

The normal blood urea is accepted as being somewhere below the level of 30 milligrammes per 100 cubic centimetres of blood in an individual under 30 years of age, and in any person a figure of 40 milligrammes and over is very suggestive of defective urea metabolism.

In cases of albuminuria without the presence of casts or pus, it is folly to attempt to give an opinion in the absence of a blood urea estimation. In fact, patients come to the laboratory with a history of a normal urea output, and yet an estimation shows that this output is only attained by an increased head of urea in the blood. Thus, it is more satisfactory to all concerned to do full renal efficiency tests in every case.

Urine.—Renal Efficiency Tests.—The renal efficiency is tested for after the administration of a test meal of fifteen grammes of urea dissolved in 100 cubic centimetres of water. For a satisfactory estimation the following details are considered:—

(1) Estimation of blood urea.
(2) Urea concentration test.
(3) Urea concentration factor.
(4) Diastatic index.
(5) Abnormal urinary constituents.
(6) Blood-pressure and circulatory organs.

The first item has been considered. As regards the urea concentration test the normal output is taken as 2·5 per cent or over. In calculating this percentage, due allowance is made for the quantity of urine passed. The urea concentration factor is considered to be most important and the normal figure is taken to be over seventy. The diastatic index is only performed as a supplementary test. Whereas such abnormal urinary constituents as albumin, casts, pus and blood, especially in conjunction with an estimation of the chlorides, help to differentiate between parenchymatous and interstitial kidney lesions. The blood-pressure and state of the circulatory organs are investigated to ascertain whether any defect found is entirely renal.

The great value of these tests lies in the detection of vascular and interstitial changes in the kidneys. Chronic toxic conditions at any early stage may have a distinct, if moderate, effect on the urea metabolism. Thus in chronic alcoholics, before permanent lesions are apparent, the urea excretion is often found to be abnormal. This, along with evidence of physical inefficiency, is an early sign of more damage to follow, unless the cause is removed. It is difficult to be sure, without the patient's admission, as to the exact toxin at work, but the complete examination eliminates many causes. However, the results of the test are apparent to the patient, who is readily convinced of the damage done. By informing him that the present lesion is probably temporary and will become normal, if the excesses are stopped, the average patient sees reason and is soon rendered efficient. Further tests performed at intervals of a month or so show whether the case is likely to recover.

Although the newer renal tests are of such great value, the older tests must not be ignored. Thus, cases of renal tuberculosis have been met with where full efficiency tests have revealed a defective renal excretion, but the urine had not been examined for the tubercle bacillus.

Cases of slight albuminuria have been from time to time encountered, in which a detailed examination has revealed either the ova of *Schistosoma hæmatobium* or the *Bacillus tuberculosis* to be the cause of the trouble. In some cases the condition had been overlooked for a considerable period of time. For this reason microscopical and cultural examinations are performed on all urines, and the deposit is always stained for the tubercle bacillus.

As an example of the importance of investigating the cause of all instances of albuminuria, a short history of a case of vesical schistosomiasis may be given. The patient was born in Bareilly, India, in 1901, and came to England in 1903. He went to South Africa (Orange Free State and Natal) in 1906, and remained there until September, 1914, when he returned to the United Kingdom. He had not been out of the United Kingdom since that date, or in other words for nine years. The man claimed to have enjoyed perfect health at all times. He appeared before the Central Medical Board, Hampstead, in April, 1923, to be tested for fitness to become a non-commissioned officer pilot, but was rejected on account of albuminuria. Subsequent examination revealed a heavy infection with living ova of *Schistosoma hæmatobium*. Had this patient not applied to become a pilot this infection would probably have escaped notice, and as he was on the waiting list for overseas the results might have been disastrous.

Fæces.—The importance of the early detection and eradication of infections of the gut with recognized pathogenic bacteria, protozoa and helminths is agreed upon by all, but this does not hold good for *Lamblia intestinalis*.

That *Lamblia intestinalis* is pathogenic is suggested by the following observations. Repeatedly, when doing a routine investigation of a case, the blood picture has favoured the diagnosis of a protozoal infection, and on completing the examination the presence of *Lamblia* in the gut has been the only abnormality found. Further, with the eradication of the parasites, improvement in the patient's general condition has followed. Many such patients show loss of nerve and muscle tone, as is made evident by the physical efficiency tests, especially by the presence of heterophoria.

Because infection with *Lamblia* is so common in warm climates, and so difficult to eradicate, it is convenient to label it as non-pathogenic. The common cold occupies a similar position in these climes, but its pathogenicity is now no longer doubted.

Sputum.—Tuberculosis is so common and starts so insidiously that it is liable to reveal its presence first in the form of a lowered physiological efficiency. On this account the sputum is always examined, if available.

Throat Swabs and Peridental Smears.—The mouth, teeth and gums are examined as a routine in the laboratory. Oral sepsis, probably by virtue of the large blood-supply to the mucosa of the mouth, may cause rapid and profound symptoms of sepsis, the first signs of which are often of a nervous nature. Such defects are readily revealed by the usual Air Force tests. The diphtheria bacillus is not the common offender here, but most frequently it is Vincent's bacillus, spirochæta, or streptococcus.

Blood-sugar Content.—The blood-sugar content is not estimated unless there is a glycosuria. It has been found advisable to do full glucose tolerance curves on patients with sugar in the urine, as the great majority of these cases have proved to be examples of "lowered renal threshold" and not true diabetes. Their after-history in the service will be interesting to follow, but at present the diagnosis of potential or early diabetes is not justified.

A scheme for routine examination, such as that outlined, is incomplete without a rapid, accurate and concise method of keeping records. These records are of enhanced value if they are kept in a form for the ready compilation of statistics. For these reasons the Royal Air Force pathological records are kept in tabular form.

This examination may appear to be somewhat full, but if only certain tests are asked for and acceded to, the pathologist is accepting the physiologist's or physician's diagnosis without ascertaining whether this is the sole or chief reason of the physical inefficiency.

In conclusion, brief mention may be made as to cost. It might be argued that such a routine pathological overhaul will increase the hospital cost per head by prolonging the patient's stay in hospital. As the set of tests are collected within a period of two to three hours, and completed within twenty-four hours, there is no prolongation of hospital treatment; in fact there is no need for admission to hospital in most cases.

THE STABILITY OF SOLID CALCIUM HYPOCHLORITE.[1]

By Major H. H. KING, I.M.S.
Central Research Institute, Kasauli.

The war brought into prominence the use of hypochlorites as disinfectants, first for the sterilization of drinking water, and secondly, either alone or with other substances, for surgical purposes. Later years have seen their use extended, so that now they hold a position of the greatest importance. The hypochlorites mainly used are bleaching powder and substances derived from it. Solutions of sodium or calcium hypochlorite chemically or electrolytically prepared are also used. Here I wish to bring to the notice of the English-speaking world generally, a substance, solid calcium hypochlorite, whose advantages, as regards concentration and stability, seem to be appreciated at present most in Germany. By calcium hypochlorite I mean the salt in which *both valencies* of the divalent calcium atom are satisfied by hypochlorite radicles, and which would thus have the formula $Ca < {}^{OCl}_{OCl}$. Now, whatever may be the real constitution of bleaching powder, there is no doubt that quantitatively its formula is fairly accurately expressed by $Ca(OCl)Cl$ plus a varying amount of lime. Therefore it is obvious that theoretically solid calcium hypochlorite can have almost double the available chlorine strength of bleaching powder, and more than double, if there be but little free lime present with the calcium hypochlorite as compared with the thirty-three per cent or more present in "bleach." To turn aside for a moment, I need hardly point out that the *available* chlorine is not necessarily the same as the *actual* chlorine present. The available chlorine is the amount of free chlorine to which a substance is chemically equivalent. Thus one atom of chlorine in a hypochlorite radicle is equivalent to two atoms of free chlorine. To return to solid calcium hypochlorite, theoretically it promised so much if only it were stable, that it seemed well worth investigation. Thorpe's "Dictionary of Applied Chemistry" stated that it was manufactured in Germany under certain patents, and described it as a crystalline solid that contained eighty to ninety per cent of available chlorine, and that it was reputed to be stable.

Now it is well known that, for all practical purposes, the disinfectant action of hypochlorites is proportionate to their available chlorine strength, so these my first experiments, which I shall describe, have been devoted to ascertaining whether the promise of high and sustained available chlorine strength is fulfilled in practice. I would recommend those who are interested in its direct disinfectant action to read a paper by Fischer and Kadisch in the *Zeitschrift für Hygiene*, April, 1924.

[1] This paper was read at the Indian Science Congress, Benares, January, 1925.

Tins of the calcium hypochlorite preparation were posted to me from Manchester at the end of November, 1923, and reached me at Kasauli in January, 1924. Two tins tested in February were found to have the same available chlorine strength of 74·4 per cent. Their original strength must have been higher still; the substance is made in Germany. In order to test the effects of (A) ordinary storage in the dark, (B) heat, (C) light, (D) vibration, (E) exposure to air, the following experiments were made. Five small glass-stoppered bottles were half filled with calcium hypochlorite and the stoppers waxed down. The first was put in a wooden box which was kept in an ordinary room cupboard. The second was put in an incubator (in the dark) at 37° C. (i.e., at 98° F.) for 66 days, after which it was kept in a box in a cupboard for 174 days from May to October; then it was put back in the incubator at 37° C. for 67 days, so that it was exposed to a temperature of 37° C. for more than 4 months, and to the air temperatures of a hill hot weather and monsoon for a little more than 6 months. The third bottle was put on a shelf exposed to indirect light. The fourth was put in a wood case and shaken by a vaccine-shaking machine for about six hours a day on 12 days in the first month, after which it was kept in the cupboard. The fifth was put in a wooden case open at the top and was left unstoppered on a shelf. At the end of the 10 months the final readings for available chlorine strength were as follows:—

(A) Cupboard (in the dark)	67·7 per cent
(B) Incubator 4 months, cupboard 6 months ..	56 ,,
(C) Exposed to light	66·7 ,,
(D) Exposed to vibration	67·7 ,,
(E) Exposed to the air	24 ,,

The initial strength was 74·4 per cent, so clearly ordinary storage did not seriously affect the chlorine strength, nor did light or the small amount of early vibration. The only factors that had any force were heat and exposure to the air. The latter need not concern us, as it is not legitimate treatment. What, indeed, surprised me, seeing the sticky mass that was left, was that the chlorine reading was as *high* as 24 per cent. Though the effect of heat on the half-full bottle was to reduce the strength from 74·4 per cent to 56 per cent, yet its effect on a full tin, treated in exactly the same way, was only to reduce the strength to 62·3 per cent, so that the claim made by its manufacturer that the minimum strength is 60 per cent held good for a full tin. Tested after the first 2 months in the incubator, the strength of both the tin and the bottle was 67·4 per cent, which is a comparatively high figure. Seeing that it is very unlikely that the conditions of storage, so far as the effect of temperature is concerned, in any station in India over ten consecutive months would be more severe in total effect than the conditions of the second experiment, we may say that the deterioration there found probably represents the maximum deterioration likely to be obtained anywhere in India in ten months. In estimating the severity of an incubator temperature we must bear in mind its continuous nature as compared with the short duration of the higher

temperatures reached in many stations in the hot weather. Nowhere in India does the monthly mean daily temperature exceed 98° F. My conclusion from these first experiments is that the samples obtained of solid calcium hypochlorite were reasonably stable.

Before going further, it will be interesting to compare with the results already recorded the results of exactly similar tests made on ordinary "bleach" and a "bleach" stabilized by the addition of lime that is stocked by the official medical stores.

A jar of stabilized bleach of unknown age, tested in February, 1924, had an available chlorine strength of 17·7 per cent.

Final readings for the same series of five bottles are as follows:—

(A) Cupboard	16·1 per cent
(B) Incubator and cupboard	12·5 ,,
(C) Exposed to light	15·7 ,,
(D) Exposed to vibration	15·7 ,,
(E) Exposed to the air..	8·6 ,,

These results correspond more or less closely with the previous ones if we calculate the proportion each loss bears to the initial strength, but of course in this second case the action has been at a much lower level. The small effect of light and vibration, and the great effect of exposure to the air that were noted in the first set of experiments, are also to be noted in this second set. The effect of only two months' incubator temperature was to reduce the strength to 15·2 per cent available chlorine.

A bottle of ordinary bleach at the beginning of the ten months' experiment had a strength of nineteen per cent of available chlorine. Two bottles put up for experiments A and B gave the following results:—

(A) Cupboard 10 months	8·3 per cent
(B) Incubator 2 months	10·5 ,,
(C) Incubator 4 months, cupboard 6 months ..	0·07 ,,

The instability of ordinary bleach is well shown by these results, particularly the last, with its reading of practically zero per cent. By comparison, both calcium hypochlorite and stabilized bleach, seem very stable substances. I think that there can be very little doubt that the chief reason for the superior stability of these two substances is their *dryness*. The samples of calcium hypochlorite obtained were in the form of a very dry powder. A thorough *in vacuo* drying is probably essential for its stability. I would also draw attention to the nature of its containers, first, the tins are *airtight* through the use of a washer round the lids, and secondly, the tins are *painted* with some bituminous paint, thus preventing the deleterious catalytic action of rust.

Apart from its high content of available chlorine, this preparation of calcium hypochlorite has a distinct advantage over bleaching powders in that the proportion of free lime and extraneous matter is very low so that a solution in water gives *very little sediment*. This property is of particular value in the chlorination of drinking water.

Given the stability and strength that I have shown to exist in the

samples tested, the advantages of preparations of solid calcium hypochlorite as disinfectants are very great. This is particularly the case where transport is a consideration, as in armies on campaigns or manœuvres, in exploring and other expeditions, and in travel generally. Indeed, to my mind, solid dry calcium hypochlorite is the most important of the disinfectants that an army in the field should carry, particularly in frontier and similar campaigns, for not only would it serve for the sterilization of water, but it would also serve as a surgical disinfectant, both by itself in simple solution and as a source of hypochlorite for the preparation of eusol, etc. The fact that on the average it is three times as strong as "bleach" would mean that only one-third of the weight of equivalent bleach would need to be carried. It would be an advantage for ready use were it available in the form of tablets. Another situation where it would be of particular advantage is in epidemics of cholera, etc., in districts with bad communications as are common in India.

In ordinary civil life the choice of a hypochlorite disinfectant is governed mainly by the cost. Into this I will not go, as the problem varies with every different locality, except to say that, where electric power is available in India, electrolytic hypochlorite will probably always be the cheapest. My intention here has been to show that dry solid calcium hypochlorite is a stable product, and that it has great advantages as a disinfectant, where portability is a factor of importance.

Finally, there is another use of it to which I may draw attention, namely, its use as a chemical reagent. It is a powerful oxidizing and chlorinating agent and may serve to facilitate certain reactions such as the production of chloramines. I must warn users of it that there is the danger of an explosion if it be rubbed up with organic or other easily oxidized (or easily chlorinated) substances.

There is nothing particular to mention about the technique of the tests for available chlorine, which were done in the ordinary way by titration with decinormal sodium thiosulphate after the addition of potassium iodide and acetic acid to measured volumes of a known dilution of the bleach. The sodium thiosulphite solution was standardized against a solution of arsenious oxide in sodium carbonate, each being titrated against the same iodine solution. I found it advisable in setting up standards to begin with iodine, which was purified by precipitation and sublimation, and not to begin with arsenic, with which an insoluble residue was repeatedly obtained. Since the iodine solution did not keep well, the arsenic was kept as the permanent standard. In the course of some previous work I happened to observe that the blue "iodide" of starch disappears when excess of starch is added—indeed the delicacy of the starch test is spoilt if an excess of starch be present. I do not know whether this observation has been made before—I can find no record of it.

A CORRESPONDENCE CIRCLE.

XIV.

Research on Clinical Medicine in Tropical Disease.

By PHILIP MANSON-BAHR.

Protein Shock Therapy.—I have been much impressed with the possibilities of this new line of treatment, as applied to the more chronic forms of tropical disease. The most effective method of producing "protein shock," of which I have had experience, is the intravenous injection of a dilute solution of the ordinary typhoid-paratyphoid vaccine, which is supplied to the Army. In order to get a sufficient reaction, that is a high temperature of 103° or 104° F., associated with profound sweating, it is necessary to give a dose of at least 100,000,000 organisms; this can be done by diluting down the vaccine twenty-five times. The second or third dose, sufficient to produce a reaction, has to be two or three times this strength. I find this much more reliable than the various milk and peptone solutions which have been put on the market. I think, too, that it is most necessary to inject the solution *intravenously* and not intramuscularly, as is sometimes advised. The indications, to my mind, for protein shock therapy are many. There are, for instance, certain obscure and fugitive forms of arthritis, of which I have seen two examples, one a member of our own profession, a specialist in surgery who was afflicted at periodic intervals with a fugitive and very painful swelling of his interphalangeal joints, which entirely incapacitated him from following his profession. The source of infection had, in his case, been attributed, as is usual, to some obscure and hidden septic focus concealed somewhere in his body. The bacteriologist, as so often happens, found an excess of streptococci in the fæces. Prolonged vaccine therapy had failed to afford any relief, but after two injections of protein shock therapy, I hear he has now entirely recovered and is able to operate once more. There is a similar case of a lady, in which the arthritis was accompanied by a profuse urticaria, the treatment of which has also been followed by a similar remarkable result. The illness of this lady, which entirely incapacitated her, had also been attributed to some streptococcus infection. Protein shock in her case cut short the arthritis, the affected joints once more became mobile, and for the last two years there has been no recurrence. I have come to regard association of arthritis and urticaria in this obscure condition as a kind of anaphylactic phenomenon, or a super-sensitization of the body to small doses of some specific toxin.

There is one condition in tropical disease in which, possibly, the protein shock acts in the same way; at any rate, it is specific. This is climatic

bubo, which is a form of adenitis, not uncommon in tropical climates and which may be prevalent among troops in India, China and the West Coast of Africa. I think there is little doubt from the observations made in recent years that the infection is venereal in origin. At any rate, it is a most obscure and incapacitating disease which, no doubt, classified under various headings, may be responsible for a great deal of invalidism in the Army. The disease generally commences with a prolonged fever of a remittent type, accompanied with painful inflammatory swelling of the groin glands. The affected glands may enlarge to the size of a hen's egg and then break down with a discharge of a thin, purulent matter through various fistulæ. Unfortunately, surgical interference very often only tends to spread the mischief; the pus from the bubos is sterile on culture and the undoubted bacterial origin of the disease is unknown. I would suggest that this subject presents a fine field for research. Of the various forms of treatment devised for this condition, there is no doubt that the protein shock therapy is specific. It cuts short the process of suppuration and subsidence of the glands takes place almost instantaneously and, in short, the treatment of climatic bubo is terminated within a week, whereas formerly the case lingered on for six weeks, two months, or more. During the last two years, I have had striking instances of the efficacy of this form of treatment, one patient had been diagnosed as suffering from some obscure fever for four weeks before the true condition had been realized. There are other conditions in which, I think, protein shock therapy may be used as adjuvant to other forms of treatment. I have seen cases of obstinate tertiary syphilitic lesions, such as ulceration of the leg, or stricture of the bowel, in which the administration of salvarsan and potassium iodide became effective only when combined with protein shock. I certainly think this is a line worth further trial. The actual shock itself lasts usually from twenty-four to forty-eight hours. During this time the patient feels ill, very much as he would in a sharp attack of malaria; he has a furred tongue; loses his appetite; feels generally depressed, but rapidly recovers. Apparently the shock produces a large amount of leucocytes in the blood. The recent work of Row and others in leprosy, using various kinds of bacilli for intravenous injection in this disease, is probably based also on the same principle, that is, one which produces a series of high temperatures, associated with a leucocytosis in patients who suffer from hypothermia and general asthenia. It is very obvious that further research in this method of treatment is necessary in many obscure and chronic infections.

The Treatment of Colitis.—In my last communication I mentioned a new treatment called yatren which, when injected into the bowel, has been found to be remarkably specific for amœbic dysentery. Further work on this subject has confirmed my earlier experiences. It is certainly a very rapid and pleasant method of curing an infection of the bowel, but there is great discrepancy in the opinions of various workers on this subject.

Apparently, as far as I can see, it is more efficacious in eradicating an early than a long-standing infection, but I have had such a long series of consecutive successes that I feel it is worth giving a trial in every case. In long-standing and chronic conditions, with a passage of cysts, I am now combining the intrarectal injections of yatren with the administration of E.B.I. in three-grain doses by the mouth. In order to produce the maximum effect the injection of yatren should be preceded by a thorough bowel lavage with two per cent sodium bicarbonate which clears the mucus and debris out of the bowel. The comparatively small quantity of yatren, 200 cubic centimetres, is then injected slowly into the rectum and allowed to remain there as long as the patient can retain it. If he is kept in bed he will probably do so for eight to ten hours. Naturally, the lower down in the rectum the amœbic lesions are situated the more rapid will be the action of the drug. A ten days' course is usually sufficient; but some patients are unable to tolerate this intensive treatment, so that in this case the injections must be made on alternate days. When given by the mouth, yatren, apparently, is not nearly so effective and is apt to produce an acute diarrhœa. Since yatren has been applied to amœbic dysentery, it has been found to have a distinct therapeutic action in other conditions. During the past six months I have had three cases of acute bacillary dysentery (all Shiga infections), in which an almost instantaneous improvement took place after the injection of yatren. There is every indication that it will prove to be a useful and easily tolerated method of treatment in this serious disease. There are other and more intractable forms of colitis with which we have to deal from time to time and which are often confused with the better-known forms of dysentery. These are mucous and ulcerative colitis. I do not think I am going too far in saying that yatren is the only drug, so far, which I have found to be of any use in that distressing condition known as mucous colitis. The injection of the drug causes a great discharge of the peculiar, stringy mucus, with consequent relief to the patient upon whom it has a marked stimulative action. After a course of treatment, as already described, I find that the best method is to continue with the yatren by mouth in small doses, in pill form, of which one may be taken three times a day, after meals. This ensures in some manner the continuous excretion of the mucus, so that it no longer becomes clogged in the patient's intestines.

Ulcerative Colitis.—This is a most terrible and distressing condition, for which there is no known specific treatment at the present moment. It is too early to say much yet, but I have had recently an experience of an early form of the disease, in which yatren caused a healing of the ulcers and a great physical improvement in the patient resulted. He has now been free of the symptoms for over nine months. It certainly would seem advisable that a further trial of this method of treatment should be given in this intractable disease.

Editorial.

TRANSMISSION OF DENGUE FEVER.

DENGUE fever figures more frequently in statistical returns from military garrisons in the tropics and sub-tropics than, perhaps, is generally realized. In the Report on the Health of the Army for 1924, 1,124 cases of dengue fever are recorded, of which 1,005 occurred in India, and 107 in Malaya; Ceylon, the West Indian and China Commands also contributed a few cases.

Experimental research in the transmission of this disease by mosquitoes was first attempted by Graham in Syria in 1903, when he reported that he had transmitted dengue by the agency of *Culex fatigans* (*quinquefasciatus*); his results, however, were inadequately controlled, and he apparently worked with more than one species of mosquito; in fact there seems to be some doubt as to whether *C. fatigans* really occurs in Syria.

The American investigators, Ashburn and Craig, working in Manila in 1906, announced the apparently successful transmission of dengue by *Culex fatigans* in the case of one subject who volunteered for the experiment. They recorded their experiment with due caution, and considered their work was incomplete and required confirmation.

A real and tangible advance was made by Cleland and Bradley in Sydney in 1916. They worked with a mixed lot of laboratory-bred and wild mosquitoes that were allowed to bite dengue patients in various stages of the disease, and they demonstrated conclusively that *Ædes argenteus*[1] (*Stegomyia fasciata*) was a transmitter, but were unable to find out anything about the developmental period of the virus in the mosquitoes.

Koizumi, Yamaguchi and Tonomura made an experimental study of an epidemic of dengue in Formosa in 1917; they found that the injection of defibrinated blood taken from dengue patients gave negative results with dogs, rabbits, white mice and the indigenous species of monkey; guinea-pigs, however, died seven to thirty-six days after inoculation, and their blood was infective to other guinea-pigs on first "passage," but a third transference was negative in every case. Experimental inoculations of men gave a certain proportion of negative results, apparently due to natural immunity; but the positive experiments showed that the blood of dengue patients taken from the second to the sixth day of illness was infective, whereas blood taken on the eighth day failed to infect. It was also found

---

[1] An informative footnote on the distracting question of the nomenclature of this species will be found on p. 31, "Memoranda on Medical Diseases in Tropical and Subtropical Areas."

that five millilitres of blood taken on the third day of illness, incubated at 37° C. for ten minutes, centrifuged, and the clear serum injected, were sufficient to infect a human subject in five days twenty-two hours. Injection of the filtered serum caused infection in one case; and the average length of the incubation period was 130 hours. Microscopical examination of the infected blood by transmitted and dark-ground illumination gave no information whatever. A large number of transmission experiments were carried out with mosquitoes, but positive results were obtained only with *Ædes* (*Stegomyia*) *albopictus* and *Armigeres obturbans*, never with *Culex fatigans*. Moreover it is of interest to note that *A. argenteus* occurs so locally and irregularly that it is not considered to be a factor in the transmission of dengue in Formosa; but the closely related species *A. albopictus* is believed to be the principal transmitter in that island.

At the instigation of the Medical Department of the Research Board of the United States Army, work on the transmission of dengue was resumed in Manila in July, 1924, and carried on until January, 1925, by Lieutenant-Colonel Siler and Majors Hall and Hitchens, of the Medical Corps, United States Army.

These officers planned their experiments with the object of confirming the work of the Australian investigators relative to *A. argenteus* being the vector of the dengue virus; and also of determining the incubation period of the disease in man, the time after the onset of the fever that the patient remained infective to the mosquito, and the period during which the infected mosquitoes are capable of transmitting the disease; and finally with the intention of deciding whether *C. fatigans* is also a transmitting agent. Their research was conducted with every possible safeguard against fallacy. We will endeavour to epitomize the preliminary accounts of their methods and results, which are published in the *Journal of the American Medical Association* for April, 1925, and in the *Military Surgeon*, vol. lviii, No. 1.

Sixty-four American soldiers (volunteers) were carefully selected as subjects for the transmission experiments. The men had recently arrived from the United States and were free from disease, including syphilis. They were accommodated in a specially made ward of the military hospital at Manila. The ward was kept mosquito proof and mosquito free, and was fitted with adequate toilet and bathing facilities so that the men could be rigidly confined within the mosquito-proof area whilst taking part in the transmission experiments. No experimental work was undertaken on the volunteers until the completion of a preliminary period of eight to fifteen days' isolation to exclude the possibility of natural infection prior to the onset of the experiments.

After careful study of the local epidemiology of the disease and the associated mosquitoes, it was concluded that the species of mosquito concerned in the transmission of dengue were *A. argenteus* and *C. fatigans*;

therefore these two species only were used in the experiments, and they were all bred from the egg. For details of the technique of mosquito breeding and rearing on a large scale in the laboratory, we refer our readers to the original papers. *A. argenteus* was used experimentally for the initial feed of the blood of a dengue patient from two to seven days after emergence from the pupa. *C. fatigans*, which bites at nights only, was used when not more than five days old. As a general rule, a period of eight days or more was allowed to elapse before the presumably infected mosquitoes were fed upon a healthy man. One hundred and eleven biting experiments were carried out with *A. argenteus*, with positive results in forty-seven. *C. fatigans* was tried in seven experiments, all of which were negative.

The transmission experiments with mosquitoes showed that *A. argenteus* did not become infective until the eleventh day after feeding on infected blood, and the limits of the period of incubation of the virus in the mosquito are defined as from the eleventh to the fourteenth day.

Furthermore, it was ascertained that the patient is infective to mosquitoes in the late prodromal stage of dengue; i.e., six to eighteen hours prior to onset and during the first three days of the disease, but that the mosquito frequently fails to pick up the virus on the third day of the fever. Once *A. argenteus* becomes capable of transmitting the virus to human beings its infectivity is retained for the remainder of the mosquito's life.

Definite evidence was obtained that there is no hereditary transmission of the virus through the mosquito, and that the virus does not become attenuated or decrease in virulence as a result of continuous alternate passage through man and mosquito.

The investigators obtained no evidence that *C. fatigans* transmits dengue, and they conclude therefore that this mosquito is not a vector.

In addition to the transmission experiments by mosquitoes, there is included in the report a record of fourteen injections of virulent blood from patients in the early stages of the disease; of these experiments five gave positive results.

The incubation period of the disease was ascertained to be from four to ten days inclusive. Another interesting fact that emerged from the investigation is that dengue is followed by a definite degree of immunity; it was found that fifty-eight per cent of persons who had recovered from an attack of dengue could not be re-infected by inoculation with the blood of patients in the early stages of the disease, and that in those who were so re-infected the disease ran a milder and shorter course.

The authors draw attention to the striking similarity in the mechanism by which both dengue and yellow fever are transmitted, and they suggest that the viruses causing these two diseases may belong to the same group. They conclude that both diseases are caused by a filtrable virus present in the peripheral blood of the patient, which can be transmitted by inoculation of the whole blood and the filtrate thereof, and that both diseases are

transmitted by *A. argenteus* only. Their work has, therefore, an important bearing on the unsolved problems relating to the epidemiology and control of yellow fever.

This thorough and complete research confirms the results obtained by Cleland and Bradley in 1916. Their work has been carried further, and defects in our knowledge of the relationship of mosquitoes to dengue fever appear to have been made good, but we think their conclusion that *C. fatigans* plays no part in dengue would have been more convincing had it been supported by more negative transmission experiments with this insect; and, in view of the findings of the Japanese investigators in Formosa, it would appear probable that other mosquitoes of the *Aedes* group may prove to be efficient transmitters of dengue. It is known that the transmission of a parasite or of a virus is not usually limited to one species of vector, but a number of closely related species may harbour and transmit a particular virus. We look forward with interest to the detailed and final report in the forthcoming number of the *Philippine Journal of Science*, and in the meantime we congratulate our American colleagues on having made another really great advance in tropical medicine.

Clinical and other Notes.

CARBOLIC ACID IN MALARIA.

By Major D. T. M. LARGE.
Royal Army Medical Corps.
and
Captain V. J. BONAVIA.
Royal Army Medical Corps.

The following notes of three cases treated by small doses of carbolic acid and tincture of iodine as suggested recently in the Journal may be of interest. They were the only cases treated by this method and the result in each case was unsuccessful. Certainly they were all severe, but the treatment was given every chance of proving its worth, as each case was first of all treated with quinine in the usual way until the temperature had definitely settled, the patients were kept in bed while taking quinine, and once the temperature had fallen to normal, each man was given the fullest possible diet, which included cream, cheese, fruit, stout, etc.

Case 1.—Gunner B., admitted September 15, 1925, with temperature of 101° F., and crescents present in the blood. Routine treatment with quinine, etc., brought the temperature to normal the following day. Spleen enlarged to three fingers' breadth below costal margin (P3). History of three or four previous attacks, none of them severe enough to cause patient to report sick. General condition poor, patient looks anæmic and yellow. Total red blood-cells 3,060,000. Hæmoglobin sixty per cent (Tallqvist).

In this case quinine sulphate was given for seven days in doses of thirty grains daily, but it had no effect on the crescents. The iodine and carbolic treatment was now tried, and after the ten days' course suggested, crescents were still present, although they certainly seemed fewer.

Five days after treatment ceased the patient had another attack of malaria, this time B.T. in nature. On the diet given this patient gained eleven pounds in twenty days.

Case 2.—Signaller C., admitted September 25, 1925, with temperature of 104° F. and crescents present in blood. Routine quinine treatment brought the temperature to normal on the following day. Spleen slightly enlarged and just palpable. No appearance of anæmia. History of two previous attacks only, the first being last year. Total red blood-cells 5,120,000. Hæmoglobin seventy-two per cent (Tallqvist). Quinine thirty grains daily was given for three days and patient was kept in bed for seven days.

Immediately on stopping quinine, a course of iodine and carbolic was

commenced and was continued for ten days, but on the tenth day the temperature rose to 101·8° F. with all symptoms of malaria, and the blood was found to contain M.T. rings and crescents.

In this case the iodine and carbolic had every chance, as the patient was in good health all through, and gained weight at the rate of five pounds in eight days. Not only did the treatment not remove the crescents, but the patient suffered a relapse while actually undergoing the treatment.

Case 3.—Bombardier B., admitted October 28, 1925, with temperature 104° F. and malarial symptoms and M.T. rings in the blood. Quinine thirty grains daily ordered, but the temperature remained elevated for four days, gradually reaching normal as a result of the quinine. Crescents were found in the blood on the fifth day, i.e., after the temperature had reached normal. The quinine was continued until the sixth day, and a course of iodine and carbolic commenced on the seventh.

The patient's condition on examination after the temperature dropped was poor. The spleen was not enlarged, but the skin was pale and sallow. Total red blood-cells 3,400,000. Hæmoglobin sixty-five per cent. History of fever off and on for a fortnight before admission. No previous fever.

The course of iodine and carbolic in this case consisted of two minims each of tinct. iodi and acid. carbolic three times a day for fourteen days. At the end of the course, the spleen was palpable and hard, and crescents were still present in the blood. Patient gained weight at the rate of five pounds in twenty-one days.

In all three cases the crescents were distinctly fewer at the end of the treatment, but it is probable that the rest while in hospital and the nourishing diet played their part in the reduction.

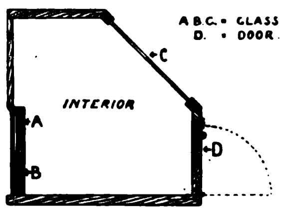
A LIGHT-TRAP FOR FLIES.

By Squadron Leader P. M. KEANE.
Royal Air Force Medical Service.

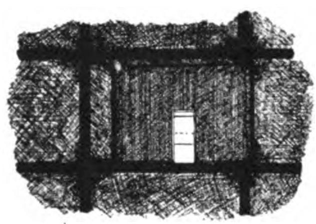
This trap owes its success to the advantage taken of the fly's apparent fear of darkness and its efforts, in consequence, to escape from it. The room in which the trap is set must be capable of being made dark in the most absolute degree with the exception of the face of the trap itself through which light still enters the room. A 'chink' of light under a door or reflection from the surface of the interior of the wall in the immediate vicinity of the trap-face may provide sufficient light to reassure the flies and to cause them not to enter the trap. The trap may be installed in a wall or in a section of a window-frame, and a southerly aspect should be selected in order to obtain intensity of illumination. The trap consists of wood and glass ; the actual trap-face is of glass, the surface area of which measures not more than four inches by one inch in two pieces

overlapping and separated by a distance of a quarter inch—two microscope slides may be used. The lower and posterior glass section is flush at its lowest part with the woodwork. The upper section allows a quarter inch space between its highest point and the woodwork. The floor, sides and back consist of wood. A portion of the roof consists of a glass window. The back can be opened for the purpose of cleaning the trap.

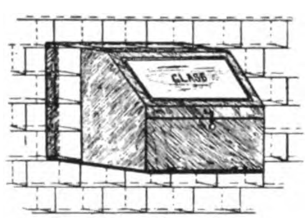
The greater portion of the trap projects into the open air and in this way illumination of its interior is assured. The trap need not be made to any standard size. The following diagrams indicate the lines of construction:—



1. SECTION.



2. INTERIOR VIEW



3. EXTERIOR VIEW.

When it is desired to bring the trap into action the room is made absolutely dark except that light penetrates through the trap-face. All flies that are active will immediately fly towards the trap and enter it. This is done with the celerity of bees entering a hive; in a short space of time hundreds of flies may be made to pass through the trap-face. Flies which are resting should be disturbed by fanning. Some pyrethrum powder on the trap-floor accelerates the death of the flies. Flies do not attempt to return to the room even after light has been re-admitted through the ordinary entrants.

Flies can be kept from entering a room by providing door and window

curtains consisting of one-inch webbing braid weighted by steel washers held in place by aluminium eyelets. These are much cheaper and more serviceable than Japanese bamboo-and-bead curtains. By dyeing the lengths of braid in contrasting colours the unsightliness which arises from the soiling of white braid will be avoided.

A simpler variation of this trap may be employed by making a small loophole in a wall fitted with glass as already described. The flies will then escape outside the building. If a building is made fly-proof, and with the use of braid curtains a room can be made almost perfect in this respect, the fact that the flies are not killed in the trap but escape need not cause anxiety.

There has not been an opportunity for testing this type of trap by employing artificial light instead of sunlight. I see no reason why such a modification should not give as good results as the type described.

The type is most suitable for inclusion in newly constructed buildings in such places as messes and kitchens. Great care must, however, be taken to ensure that 'zero' darkness can be brought about at will, and in order to do so external window-shutters will, therefore, have to be substituted in place of jalousies.

Travel.

SECUNDERABAD—AN APPRECIATION FROM THE POINT OF VIEW OF AN R.A.M.C. OFFICER.

By Captain S. SMITH.
Royal Army Medical Corps.

(*Continued from p.* 387.)

Secunderabad.

Tennis.—The gymkhana owns eight excellent hard courts immediately opposite the Services Club; these are most popular and usually crowded. There are always amongst the members some fine exponents of the game, British and Indian, and there is some very keen tennis during the annual club and open tournaments.

There is also an annual quadrangular tournament run on the same lines as the cricket tournament. The Mohammedans, who include some very strong players, were the winners of this when I was in the station.

Racing.—The usual gymkhana meetings are held periodically and two years ago a successful attempt was made to revive the "pucca" race meetings; good prizes were offered and horses from the famous Mysore and other stables were entered.

There is a flourishing race club.

Boating is now, unfortunately, a thing of the past, although, at one time, before the Hussain Sagar reservoir was allowed to run dry, excellent regattas were held on its waters; there is still a club house no longer used on the shores of the tank, stocked with various racing and pleasure craft.

Bathing.—Most of the units possess large closed-in baths in their lines, and at Bolarum there is a swimming club, mixed bathing being very popular during the hot summer evenings.

Shooting.—The "scatter-gun" shooting in the immediate neighbourhood has been poor of recent years; the tanks have nearly dried up as a result of a series of poor monsoons and duck have been difficult to find. Partridge and quail can be walked up with difficulty but are hardly worth the trouble.

Fair snipe-shooting is to be had amongst the paddy fields.

Panther abound in the neighbourhood, and anyone with the necessary skill and local knowledge, and with the help of a good and honest native shikari, can kill several during the season.

In the old days I am told they were rounded up and hunted on horse-back with the spear just as "pig" are killed to-day, so numerous were they in the district, but nowadays they are usually shot from a rough "machan," a goat being sacrificed as "kill."

Tiger are rarely seen, but two years ago a tiger was shot by a young cavalry officer within a few miles of his mess at Bolarum. If one is keen on big game shooting a "shooting block" can be hired for the season in the Nizam's dominions. Farther afield in the Nilgherries, bison and other big game are to be found.

There is unfortunately no pig-sticking to be had in the neighbourhood.

Dogs.—The climate suits dogs fairly well, but rabies is endemic. My own inclination, shared by few, is against keeping dogs in India unless permanently stationed in the hills.

Medical.—The British Station Hospital (officially a first-class hospital) was originally a noble's country palace and is one of the finest military hospitals in India. It is a large two-storied building with ample roof space, and its fine roomy wards provide plenty of ventilation even during the hottest months. There is a wide verandah running the whole length of the upper (medical) block which is eminently suitable for convalescent patients.

Electric light and fans are fitted throughout. A small "annexe" in the grounds serves as an officers' hospital with accommodation for four officers. The families' hospital, which has recently been much improved, and two special rooms for officers' wives added, is about a mile away.

There is also, as noted above, a British Section (V.D.) Hospital with a separate staff, situated in North Trimulgherry.

An Indian Station Hospital (first class) and Indian Section Hospital serve the needs of the Indian troops.

In the town there is a large modern hospital built on the pavilion system

under the care of the Residency Surgeon; also a first-class cantonment hospital.

In addition, there is a small well-equipped hospital at Lalaguda for railway employees under the care of the two railway doctors.

The medical work in the station is excellent, and ample opportunity is provided for clinical study in most of the usual tropical diseases such as dysentery (the incidence of which is high in Secunderabad), malaria, enteric fever, etc.

Sporadic cases of bilharzia, Malta fever, anthrax, and cholera also occurred while I was in the station.

FIG. 3.—British Station Hospital, Secunderabad.

Sandfly fever is, however, but rarely met with, and dengue apparently only occurs in imported cases.

A few years ago serious outbreaks of cholera and plague occurred at Hyderabad city, but in neither case were the British troops affected.

In spite of this somewhat formidable list of tropical diseases, the health of the garrison is good, the sick rate being little above that met with in a home station.

There is a well-equipped brigade laboratory attached to the hospital where every medical officer can keep himself *au courant* with laboratory work.

An occasional visit to the civil hospital is well worth while, as many examples of tropical and other indigenous diseases not to be met with amongst British troops can be seen there. Their methods are quite

up to date, and I saw my first blood-sugar estimation as a preliminary to insulin treatment carried out at this hospital.

There is a very active branch of the British Medical Association, thirty to forty members, mostly practitioners from Hyderabad and Secunderabad, attending the clinical meetings.

Appointments.—There are several appointments carrying extra pay in the station, but recently owing to a dearth of junior I.M.S. officers, the R.A.M.C. have obtained the lion's share.

The chief appointments carrying extra pay are :—

(1) Medical Officer in Command of the Cantonment Hospital, Secunderabad. Rs. 175 per mensem. This is by far the best "perquisite" available, and offers an excellent opportunity of studying tropical diseases amongst natives. The cantonment hospital is quite well equipped for the work required of it and possesses a fairly complete set of midwifery instruments.

(2) Medical Officer in Command of the Cantonment Hospital, Bolarum. Rs. 60 per mensem.

(3) Staff Surgeon, Secunderabad
(4) Staff Surgeon, Bolarum
} Each of these "carry" Rs. 60 a month and my only comment is that the money is well earned.

Welfare Centres, etc.—A flourishing welfare centre was inaugurated in 1921, after a summer disastrous to infant life, and has proved a marked success.

Women and children keep very "fit" during the cold weather, but are apt to "wilt" during the hot months.

Two months' sojourn in the hills is almost a necessity for both, and although many women "stick out" the hot months, their health suffers, and they become more susceptible to the various diseases occurring during and immediately after the rains.

If annual trips to the hills be made, and due attention be paid to the essentials of tropical hygiene, *a mosquito net being used throughout the year*, one's family should keep fit and strong.

Sanitation.—The sanitation, generally speaking, is good, the bazaars and native villages in the vicinity of the British lines being well supervised.

The water, fully chlorinated and sedimented at the source (Gundipet reservoir, fourteen miles away), is above suspicion and palatable.

There is a gradual fall from Trimulgherry, and the sandy porous soil prevents accumulation of surface water, a very desirable feature in a malarious country. Refuse and excreta are incinerated daily in the lines, and urine is run into large soak-pits.

Transport.—A motor-car is of all luxuries the most necessary, and should be purchased as soon as possible after arrival in the station.

Without some form of locomotion one's horizon becomes far too restricted, and social activities are much curtailed.

Many, especially amongst the "gunners" and cavalry, are content with a horse and trap, but in view of the expense of upkeep of a horse these

days and the straggling nature of the cantonment, a car is very much more useful, and is not expensive either to buy or run.

The cantonment is very self-contained and few long drives are possible, so that a large touring car has few advantages over the small "runabout."

A "push-bike" or small motor-cycle as an addition is useful and petrol-saving, if one's professional duties in the cantonment entail much running about.

FIG. 4.—Char Minar, Hyderabad (Deccan). A notable landmark in the centre of the city.

There are many interesting drives to be had within a few miles of Secunderabad; amongst others may be mentioned :—

Hyderabad City (population 450,000), founded in 1589, is the fourth largest city in India, and whilst surrounded by suburbs containing many fine modern buildings, holds within its ancient walls much of mediæval interest.

The streets are narrow, crowded and tortuous. In the centre of the city is the splendid "Char Minar" (four minarets) built in 1591; a replica of this building appears on all the State coins. A characteristic street is the "Chowk" where are situated all the armourers' shops, which

display a varied collection of mediæval instruments of war (most of them of more modern manufacture than the vendors would have one believe).

Many of the pedestrians in the streets are armed, wearing a weird assortment of ancient pistols, swords and daggers in their belts. There is one deadly instrument, a special kind of thrusting dagger peculiar to Hyderabad.

Some little distance from the city is the sumptuously furnished Falaknuma Palace, where the Prince of Wales stayed with his staff during his recent visit to the State.

Between Hyderabad and Secunderabad lies the Hussain Sagar reservoir, which when full extends over an area of eight square miles. This tank

FIG. 5.—One of the typical cave-like armourers' shops in the "Chowk," Hyderabad.

was at one time a fashionable resort for the élite of the city but is now unfortunately almost empty. The road connecting Hyderabad with Secunderabad lies for about a mile over the dam enclosing the waters of the tank. Even during the hottest months a very welcome breeze is met as one drives along this fine stretch of road.

To the south-west of the city lies another fine stretch of water, Mir-alum. The dam of this tank is somewhat after the Italian style and was constructed out of the prize money obtained after the fall of Seringapatam.

To the west are the famous fort and tombs of Golconda. Both are of great historical and pictorial interest and are well worth a visit.

Moonlight picnics to the tombs are extremely popular and are constantly being organized.

Near Secunderabad in the suburb of Chudderghat are the well-kept public gardens and Zoo. Many of the animals in the latter, most of them indigenous to the Nizam's Dominions, are fine specimens. There is also in the grounds a small building, containing a selection of articles produced in the country. A variety of silk of characteristic sheen from the city, carpets from Warangal and specimens of the famous Bidar ware being amongst the exhibits.

Further afield lies Warangal, a town of some historic importance, now noted for its carpet manufacture; Aurangabad on the metre-gauge railway, one of the largest and most important towns in the State of Hyderabad, was once the home of Aurangzib, when Viceroy of the Deccan in 1657.

Only twelve miles away from this town are the famous Ellora caves, by far the finest historical monument in the Nizam's Dominions.

I am indebted to the Secretary, the Nizam's Guaranteed State Railway, for much local information.

Echoes of the Past.

A HOSPITAL IN TIENTSIN, NORTH CHINA.

By Lieutenant-Colonel F. G. FITZGERALD.
Royal Army Medical Corps.

These notes are taken from the report dated January 11, 1861, on a hospital at Tientsin, for the treatment of sick Chinese, established by the British Army of Occupation.

A British force being quartered in Tientsin there was a good opportunity of extending the benefits of European medicine and surgery to the native inhabitants of the north of China.

Brigadier-General Staveley, Officer Commanding Troops, was approached by the Deputy Inspector-General of Hospitals (C. A. Gordon) with a view to establishing a hospital for this purpose.

A committee consisting of the D.I.G. Hospitals and the D.A.Q.M.G. and the Acting Consul was formed, and a hospital to accommodate twenty indoor patients was provided.

Dr. Lamprey, Surgeon of the 67th Regiment, and Staff Assistant-Surgeon Moffit offered their services free, thus there was no difficulty in respect of medical attendance for probable applicants, yet the scheme could not be considered other than experimental for various reasons, e.g., the prejudices which the lower orders of the people had been taught to entertain for the foreigners were so great as to prevent them from availing themselves of the benefits held out to them in hospital. The expenditure, probable income and means of supply had to be determined.

A building to accommodate twenty patients was hired, fitted up and all necessary annexes provided for $200.

It was calculated that the probable monthly expenditure during the winter would be $140, a sum considerably above what subsequent experience showed to be necessary. During the summer months, when the costly item, fuel, could be dispensed with, the expenditure was materially lessened.

To meet the first outlay and current expenses there was actually in hand $175, of which amount $125 had been subscribed by Admiral Sir James Hope, and $50 granted by the Brigadier-General from a fund at his disposal, the proceeds of fines inflicted.

The Principal Medical Officer considering that, isolated as they were at Tientsin, there were no other means of providing a supply of medicines for use in this hospital, sanctioned the issue of a small supply from his public stock.

Captain Gordon's Royal Engineers superintended the fitting up of the rented building.

To announce the opening of the hospital, notices printed in Chinese were placarded up throughout the city.

The monthly reports showed how successful the venture was, and contained ample evidence that the fame of the institution extended far and wide among the native inhabitants of the north of China. Women, contrary to what was at first expected, flocked to the hospital in great numbers, placing themselves fearlessly and confidently under the care of the visiting medical officers.

The provision of clothing in winter for destitute patients was made by procuring condemned clothing from the 67th Regiment.

Within a month of opening, the hospital attendance had increased so much that the narrow street leading to the hospital was crowded by persons afflicted with diseases and injuries. No sooner did the wards begin to fill than it was observed how little in keeping with Western ideas of comfort were those entertained by the Chinese patients.

For instance, fireplaces which had been carefully constructed, were voted as valueless for any other purpose than to waste good fuel. Braziers containing lighted charcoal made portable in size and shape, so as to be readily carried about, or in case of need, taken into bed, were considered the best contrivance for conveying warmth.

Again, separation of beds and distance between these, important sanitary matters to us, were quite opposed to Chinese notions.

The boards and trestles that had been arranged at either side of the ward were speedily removed and placed side by side, so as to fill up one end of the ward; the inmates, strangers to each other, some affected with loathsome diseases, others suffering from severe injuries were all huddled together, each becoming acquainted with strange bed-fellows.

Amongst the patients attending, the chief diseases met with were

ophthalmia, pulmonary affections, especially asthma and tuberculosis. Skin diseases prevailed amongst the people to a great extent, being no doubt disseminated and aggravated by the filthy habits of the people.

It is of great interest to note that cases of old, badly set fractures seeking treatment had been treated originally in the native mode of treating accidents by applying stout adhesive plaster over the part and trusting to chance that union would take place.

The administration of chloroform to patients did not cause bystanders at the time to express any surprise at the wonderful effects of this agent. The Chinese are not a demonstrative people, yet it was soon discovered to have become the object of conversation among them: their mode of describing it being, that the English had in their possession a medicine of extraordinary power, one by which a person could be rendered dead and then brought to life again. It was found, however, that the Chinese required a larger amount to render them unconscious than is usually necessary in England, and that insensibility occurred without any of that preliminary excitement so often seen in home practice.

It was noted by the hospital surgeons that scrofulous abscess and phthisis among women were particularly prevalent. An explanation of their prevalence is found in the circumstance that females, partly by the artificial deformity of the feet, to which by long established custom they had to submit, and partly by the retirement to which a scarcely less barbarous custom condemns them, are almost completely deprived of exercise and exposure to fresh air.

The Chinese attendants showed great aptitude as surgical dressers.

About 1868, after the departure of the army surgeons from Tientsin, the hospital was established as a Chinese and Foreign Hospital in connexion with the London Mission, Tientsin.

Occasionally the work had to come to a standstill owing to massacres, floods, famine and plague, all of which figure largely in the annals of the past.

In 1879, Dr. Mackenzie arrived, having been appointed by the London Mission. His skill as a surgeon soon became widely known throughout the North of China. He it was who performed by request a surgical operation in the courtyard of the Yamen of His Excellency the Viceroy Li Hung Chang, so that His Excellency and his numerous official friends might see the wonders of Western surgery.

I am indebted to Mr. Longman, the Treasurer of the Hospital, for permission to make notes from reports in his possession, and it may be of interest to medical officers of the Corps to know that this hospital now takes in the Chinese followers of the British Forces in Tientsin as no hospital accommodation for Asiatics exists in cantonments.

When visiting the hospital I was struck by the enormous demand made by the Chinese populace for treatment, all the wards of the hospital were full and the medical staff also had to treat some three hundred out-patients a day.

Current Literature.

Physical Defects as Revealed by Periodic Health Examinations. Precis of an article by Louis I. Dublin, E. L. Fisk, and Edwin W. Kopf, in the *American Journal of the Medical Sciences*, October, 1925.—In this article the writers lay stress on the minor and even serious physical impairments which are disclosed by periodic health examinations, and which, often overlooked by the individual, may cause much personal suffering and needless loss to the community. Early discovery of impairments is essential if they are to be corrected.

Source of Data.—The findings in a group of 16,662 men, who were policy holders in the Metropolitan Life Insurance Company, and who were examined by the Life Extension Institute in 1921, showed that individuals above normal weight for height and age included a larger proportion with high blood-pressure, than did those whose weights were normal; also that diseases of the vital organs were commonly associated with overweight.

The examinations were carried out by some 8,000 medical men, but an endeavour was made to reach a uniformity of standard. The examination differed from an ordinary insurance examination in that it was not made with the view of ascertaining if the individuals were suitable lives for insurance, but to determine whether these persons, already insured, were in any way below the best possible condition of health and efficiency. Therefore the individuals were helpful and ready to disclose any trivial impairment in order to obtain advice and treatment.

Of those examined 59·5 per cent were over 34 years of age. Their occupations were not stated but consisted of "persons in somewhat better economic conditions than the general run of policy holders." As the examination was optional, probably those who presented themselves suspected that they were not in a good physical state.

Personal and Family History.—In 89·2 per cent no family history was given of the "specified diseases considered important as possible inheritance factors."

Conditions Most Frequently Observed.—Errors in diet, too long work hours, too little exercise, fatigue. The highest proportion of serious defects was found in the older age-groups, while minor and moderate defects were common in young men—37·6 per cent showed too high a protein intake, 36·9 per cent showed too little water intake, 40·7 per cent took too much tea, 33·1 per cent excess in tobacco, 60·8 per cent lack of exercise.

Posture, Build and Weights.—A comparatively small percentage showed correct posture, and few were of ideal weight for age; 19·1 per cent showed faulty posture, and 12·9 per cent were more than 20 per cent overweight—this tended to increase with age. Over 16 per cent showed flat feet—those under 45 years gave the highest proportion for this disability. Overweight cases, aged 35 and over, had a higher percentage of flat feet.

Overweight (20 per cent over normal weight for age).—The proportion of overweights was 4·9 per cent under 25 years, and increased with age till it was 19·8 over 55 years. The writers attach much importance to this defect. Of the overweights, 75·4 per cent were classed as having "advanced or serious physical impairments requiring sytematic and, in many cases, medical and surgical attention: 20 per cent had moderate defects requiring supervision and correction. The normal weight-group showed only 20 per cent with advanced or serious impairments. While persons definitely overweight showed a smaller percentage of arterial thickening than did normal weights, yet 12·8 per cent of overweights had blood-pressure of 20 to 40 millimetres of mercury above normal for age, as against 5·2 per cent with normal weights. Varicose veins were slightly higher (5·7 per cent) in overweights than in normal weights (4·3 per cent). The authors lay stress on the relationship between blood-pressure and overweight, particularly at middle-age periods.

Of the urines from overweight, 26 per cent were found to be abnormal as against 20 per cent with normal weight. As one would expect, more of the overweights showed albumin, and this percentage increased with age until over 55 years it was 12·2 per cent compared with 6·4 per cent for the normal weight-group. Hence it is concluded that overweight and dietary excesses embarrass both the circulatory and renal systems. This emphasizes the importance of detecting any tendency to overweight.

Circulatory System.—Rapid pulse was found to be higher amongst groups showing high blood-pressure, while among men under 25 years of age 20 per cent showed abnormal blood-pressure and the writers repeat that "arterial disease when associated with hypertension is the result rather than the cause of hypertension," and that "persons with distinctly high pressure are prone to develop diseases of the heart, blood-vessels and kidneys." From time to time overweight, high protein diet, excessive use of tobacco, septic tonsils and teeth have been blamed for abnormal blood-pressure, but of all these various factors overweight is more consistently accompanied by a high blood-pressure than any of the others.

Respiratory System.—The chief interest here is the fact that in only 2·8 per cent were the lungs abnormal. Deflected nasal septum was a defect in 25·5 per cent, while in 26·2 per cent with abnormalities of tonsils 14·2 per cent had also enlarged turbinates.

Digestive System.—Defective teeth were present in 58 per cent of cases, while 54 per cent had some abdominal impairment; constipation was present in 39·7 per cent. The observations showed no connexion between constipation and high blood-pressure.

Genito-Urinary System.—The proportion of cases showing albuminuria, casts and glycosuria is much higher amongst cases with high blood-pressure and it is considered that this was due to the high blood-pressure and not a cause of it.

Nervous System.—Defective vision was found in 54·9 per cent, with

correction in only 25·4 per cent. Defective hearing in 15·4 per cent and otitis media in 1·2 per cent.

Conclusions and Recommendations.—The indications are for wider extension of the periodical health examination, in order to control defects, especially in the field of weight control, which might lead to a reduction in the number of embarrassed hearts and damaged vessels.

The Treatment of Post-mortem Infections. By R. M. Handfield-Jones, M.S.Lond., F.R.C.S.Eng. *Lancet*, March 13, 1926. Pp. 565.—Accidental injuries inflicted whilst conducting post-mortem investigations are so common and often so trivial as to be missed, until serious and not infrequently fatal sequelæ become manifest. A review of the various aspects of these injuries forms the subject of an interesting paper which deserves the attention of individuals who may be called upon to undertake autopsies. The following abstract may be of interest to those unable to consult the original communication :—

The Nature and Site of the Injuries.—It is noted that injuries occur most frequently to the left index and middle fingers, and on the ulnar border and posterior surface of the forearms and hands. The nature of the lesion is most often a puncture wound or scratch, the former caused by pricks from a needle or knife-point, the latter occasioned by the sharp edges of the divided ribs when the hand and forearm are inserted into the thoracic cavity.

Bacteriology of the Condition.—The causative organisms in most cases are either staphylococci or streptococci. Whilst a staphylococcal infection may cause severe and widespread local conditions, it is a streptococcus which originates a fulminant type of lymphangitis and septicæmia. Bacteriological investigation of the lesion should, therefore, be made at once, both with a view to prognosis and to the preparation of an autogenous vaccine.

Prevention of Injury.—Preventive measures are considered under three headings: (1) Adequate protection; (2) proper technique; and (3) reasonable care.

Adequate protection is a matter of clothing. The apparel suitable being first a mackintosh ; oyer this a long-sleeved overall with elastic bands at the cuffs. Gloves should always be worn and should be of the gauntlet type which should reach nearly to the elbow. A pair of cotton gloves worn over the rubber gloves are an added protection against scratches from spicules of bone and do not seriously interfere with the sense of touch.

Technique.—Under this heading attention is directed to technique only in so far as the handling of instruments is concerned. Comment being made on the casual manner so many pathologists deal with their instruments. The haphazard practice of placing knives on the post-mortem table is condemned, and it is suggested that a small table astride the body should be employed as an instrument table. Attention is directed to

protection from the sharp ends of divided ribs and costal cartilages by covering them with the musculo-cutaneous flap raised from the chest wall. The advisability of sawing the ribs through further out still lessens this risk, and has the added advantage of giving more room for manipulation. Needle pricks most often occur in the process of sewing up, dissecting forceps therefore should always be employed for this procedure.

Reasonable Care.—It is rightly indicated that it is the individual with the greatest experience in the performance of autopsies who is guilty of the most gross carelessness, and it is urged that the code of the operating theatre should be adopted in the post-mortem room.

The Prophylactic Treatment of an Injury.—The procedure to be adopted on the infliction of a puncture wound or scratch is discussed at length. Such drastic measures as immediate amputation or excision of the site of injury are mentioned and dismissed as being quite unjustifiable.

The immediate steps advised are as follows:—

(1) Work should be ceased at once, and handed over to someone else.

(2) Bleeding should be encouraged, as free bleeding is the best means of cleansing the wound of infective organisms. If the wound does not bleed, or hæmorrhage is sluggish, the best method of increasing it is to passively congest the part by use of the arm compressor of a sphygmomanometer. Free bleeding should be encouraged for at least two and a half minutes.

(3) Thorough cleansing of the wound by scrubbing the part with a sterile nail brush and ether soap. It is then dried with a clean towel and immersed in an iodine bath.

(4) The preparation of iodine recommended is the alcoholic tincture and the injured part should be immersed in the solution for *five* minutes. The edges of the wound should be separated to ensure thorough penetration of the iodine. The usual method of swabbing the wound with a small amount of iodine is condemned.

(5) The wound is covered with an antiseptic dressing, care being taken that the bandage is applied lightly so that the free circulation of blood is ensured.

(6) Regarding medicinal treatment, an intramuscular injection of one cubic centimetre of a one per cent solution of manganese butyrate is recommended.

(7) Absolute immobilization of the arm on an internal angular splint should be insisted on for forty-eight hours after infliction of the injury, and the hand should be carried in a sling during the following day. The onset of swelling, throbbing, or pain would call for immediate surgical opinion.

Treatment of the Established Infection.—The infections may be classified as follows:—

(1) Acute lymphangitis.
(2) Infection of the terminal segment of the finger.
(3) Acute teno-synovitis.
(4) Infection of the fascial spaces in the palm.
(5) Pus spreading up the forearm.

In the first group, only when well-defined complications are present, such as localized abscess, etc., is active surgical intervention advised. Large old-fashioned poultices, serum treatment and blood transfusion, plus conservative treatment on general lines, are advocated. It is essentially a dangerous condition and owing to the fact that drastic surgical treatment is not called for gives rise to many difficult problems. The lymphangitis may readily respond to a few hours' treatment, on the other hand it may be of the fulminating type which rapidly floods the patient with an acute septicæmia leading to death in a few hours or days.

The surgical treatment of the other four groups depends upon an accurate knowledge of the anatomy of the part and on the position of the collections of pus. It consists of well-planned incisions which not only must be correctly placed, but must also be of suitable dimensions. If too small they will not drain the part, and if too large they may open up fresh planes along which the infection spreads. Gas and oxygen is the anæsthetic advised. A constricting band on the arm gives a bloodless operation area and is available later for inducing passive congestion. Rubber tissue should be used for drainage. After treatment consists of fomentations for seventy-two hours followed by light dry dressings. Early movement of the fingers should be encouraged. H. M. P.

The following instructions on the subject of "Prevention of Sepsis in the Post-mortem Room" have been issued by the Pathological Society of Great Britain and Ireland, in the form of a leaflet accompanying the Journal of the Society, and may usefully be read in conjunction with the above abstract on the treatment of these infections:—

I.

"Strong post-mortem gloves, not too thick, should be worn, and should be thoroughly cleansed, sterilized and dried immediately after use. Great care should be taken to ensure that there are *no holes*. A convenient way is to fill them with water, twist the wrist portion round until it is closed off and then, by pressure, test for pin-holes. The same result may be achieved by air pressure after the gloves have been dried: in this case the glove should be turned about close to the face while pressure is exerted on the contained air."

II.

"It is inadvisable to perform autopsies when there are *recent* cuts or scratches on the hands. In case of necessity, a protective covering of collodion may be used."

III.

"The greatest danger of all, and the one chiefly responsible for serious and fatal infections, is *pricking the finger*. If during an autopsy the pathologist should prick himself however slightly, whether with the knife or on a jagged bone or tooth, even if he is in doubt whether he has been

pricked at all, it is his duty *to stop* AT ONCE, *remove his glove and make the wound bleed* by digital compression causing congestion, by centrifugal force (swinging the arm), by sucking and by putting the hand in hot water. There should not be a minute's delay in carrying out these procedures, and the autopsy should be completed by someone else."

Reviews.

AVIATION MEDICINE. By Major Louis Hopewell Bauer, M.D., Medical Corps, U.S.A. Baltimore: The Williams and Wilkins Company. 6¼ inches × 9¼ inches. Pp. xvi + 241. With 35 plates. Price 34s. net.

Although there exists a considerable literature on the medical aspects of aviation both in Great Britain and in other European countries, notably in France, it is in the form of short articles in aeronautical and scientific journals, and in official memoranda. The British Air Ministry, for example, has issued some thirty medical memoranda on such subjects as medical research, temperamental fitness of the medical officer, tests for visual aptitude, for neuromuscular co-ordination and nervous stability, for circulatory and respiratory efficiency and fatigue, the medical examination of candidates for aviation, the care of the flier from a psychological point of view, the effects of high altitude and the administration of oxygen, and several other conditions regarding injuries and diseases to which the Royal Air Force is exposed. Work of this kind has chiefly been carried out in England by Stamm and Flack, and recently an exhaustive article on "Aerial Transport of Service Casualties" by Wing Commander Treadgold was published in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS. In France similar memoranda and articles have appeared, chiefly in the *Presse Médicale*, the *Revue Medico-therapeutique* and *L'aerophile*. From this it will be seen how scattered is the information on subjects dealing with aviation medicine in European countries. The author of the book, now under review, is consequently justified in stating that his is the first text-book on the subject written anywhere since the war. Major Bauer is the Commandant of the United States School of Aviation Medicine, and the book is published by authority of the Surgeon General. It contains seventeen chapters in three sections and a supplement of five appendices. The first section deals with the selection of the flyer. In considering his general physical qualifications the author makes a point of entering closely into the medical history of a candidate for flying, and would disqualify anyone with a history of acute articular rheumatism, recent attacks of malaria, syphilis, injury to the head accompanied by unconsciousness, and active tuberculosis, as well as certain conditions of the eye, nose, ear and nervous system. With regard to the best age for flying and the number of years a flyer will remain efficient, he does not recommend flying to be commenced under the age of 20 or later than 28, but does not believe flying has gone on long enough for any hard and fast rules being laid down as to the number of years a flyer will last. That must in any case depend largely on the individual. There is little that is new in the chapters dealing with the eye, ear, nose and throat, and reaction time, but the

examination of the candidate's neuropsychic condition goes probably much further than the examinations in European countries. Not only is family and personal history minutely entered into from birth onwards, but a process of psycho-analysis is carried out in the physical examinations for the United States Air Service. In a way it is inquisitorial. The candidate for example should not be asked, "do you drink?" The question should be, as the author expresses it, "accusative" and in the form of "How much do you drink?" The sex complex is examined. His attitude towards the opposite sex, the number of love affairs he has had and other intimate sex matters are, for example, the subject of inquiry.

The second section of the volume treats of the physiology of aviation and the classification of the flyer, and includes chapters on the effects of altitude on the respiratory, circulatory and nervous systems, with a chapter on tests to determine the ability of the individual to compensate for oxygen want. There is also a chapter on other altitude tests, and one on the effects of wind, cold and speed. The third section contains chapters on the care and maintenance of the flyer, aviation accidents, airplane dope poisoning, and the medical requirements of the International Congress for Air Navigation in connexion with civilian aviation. A bibliography of over four hundred writings is printed at the end of this section. The appendices consist of directions for carrying out the various tests, and examples of the forms used in recording the results. The volume as a whole is very comprehensive and exhaustive, but we would have expected one chapter at least on aerial transport of sick and wounded in a textbook of this kind. This aspect of aviation, however, is only referred to very briefly, although an excellent side-view illustration of the Cox-Kremlin airplane ambulance is given. The book meets a demand for a volume containing all that has been written and worked out in connexion with the medical aspects of aviation, and will no doubt become the textbook for our own aviation medical officers until such a time as they produce one of their own. The British agents for the U.S.A. publishers, it should be noted, are Messrs. Baillière, Tindall and Cox. The price, however, seems prohibitive and is much higher than the price of similar volumes in this country.

THE ENGINEER AND THE PREVENTION OF MALARIA. By Henry Home, M.Inst.C.E. London: Chapman and Hall. 1926. 8vo, pp. x, + 176. With 43 figures. Price 13s. 6d. net.

This book is intended to bring together the main facts in the scientific literature containing the results of research, and their application to sanitary work, in order to enable the engineer, who has been working in the tropics and out of touch with specialist publications on public health, entomology and parasitology, to obtain a general view of the modern field of operations. The author has had a wide experience of the problems of engineering work in connexion with sanitation and malaria prevention in many parts of the world, on the Central American coast, West Coast of Africa, in the West Indies, Egypt and Syria; and he has made full use of the work and experiences of others, such as Sir Malcolm Watson's well-known writings on prevention of malaria in Malaya, and accounts of work in India, Japan, Mauritius and the United States of America. The whole of Lieutenant-Colonel Mac Arthur's paper on mosquito netting, which appeared in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS in January, 1923, is reprinted as an appendix to the book. The chapters, of which there are

eleven, are all exceptionally clear, practical and well illustrated, and contain in concise form a vast amount of information, which is of as great value to the sanitary officer as it is to the engineer. In fact, the sanitary officer, who does not study the engineering problems and the economics of the preventive measures, which he insists on having carried out, may fail to obtain willing and ready co-operation on the part of the engineer, and lose much of what is of great value in sanitary work, personal influence and enthusiastic support. For this reason alone Mr. Home's book is strongly recommended as a work which should be in the possession of officers of the Royal Army Medical Corps. A knowledge, for example, of the natural causes of swamp formation and the engineer's views in regard to its avoidance will enable the sanitary officer to take a wider view of those preventive measures which depend on drainage and removal of swamps. The earlier chapters give an account of the economic loss due to malaria, and of the different types and life history of malaria vectors. A chapter on antimalarial schemes is headed by a schedule of the method and means of preventing malaria, adapted from the malaria tract of the United States Public Health Service. In it the author shows the necessity, in making malarial surveys and determining the antimalarial measures which can be carried out most economically and effectively, of co-operation between the engineer, the cartographer, the meteorologist, the analytical chemist, the entomologist, the forestry officer and the medical expert.

As is to be expected in a book of this kind, the greater part is taken up with engineering problems of drainage in lowland country, to which three of the chapters are devoted. Hill drainage and details of works are also considered in a chapter on each. There is a short chapter on houses and quarters in their relation to malaria prevention. The two remaining chapters are perhaps of more interest to the sanitary officer than the others, for one deals with the practical means of destroying the larvæ by oiling, larvicides, larvæ-eating fish and natural enemies, and by the removal of vegetation; and the other with biological means of attack against the anopheline species of mosquito. This latter is the concluding chapter of the book. It is the most suggestive of all, as it refers to what may become a method of dealing with the malarial problem, which, to use the author's own words, may be found not palliative only, but decisive and radical. It refers to the importance of the study of environment of each species of mosquito and the possibility that a simple change in the conditions may banish the species from a locality where it was formerly prevalent. The hydrogen-ion concentration in water is the factor on which the range of certain species seems to depend, and it is this point which the author discusses and illustrates. In an appendix he gives an abstract of a communication by Mr. Cocking on Ph values—what they are and how to determine them—the Ph value being the number used to express the active acidity or alkalinity of any fluid. It would appear that anophelines do not breed in neutral waters or those giving a Ph acid reaction; and that this accounts for their absence in expanses of water, such as rice fields, which otherwise seem ideal breeding places. Another suggestion is that arising from the experimental work of Atkin and Bacot on the relation between the hatching of eggs and development of larvæ in the presence of bacteria and yeasts. Apparently living bacteria exert a stimulus, causing the eggs to hatch, and form the chief food of the larvæ; and, if an acid condition of a fluid is unfavourable to bacterial life, this

might account for the non-development of larvæ in non-alkaline waters. But the problem is still obscure, although the fact remains that there are certain neutral waters in which anophelines do not breed, when the conditions are otherwise excellent. The possibility is that a slight variation in the chemistry of a water will be toxic to a given vector, and that this can be effected in many cases at a small cost. The author concludes with the remark that "the possibility affords at least the chance of the employment of a new weapon against an ancient enemy."

In addition to the appendices already mentioned, there are two appendices by Dr. P. A. Buxton, one on applied entomology and the other on house flies. There is also an index, but it is neither very full nor very accurate.

MANUAL OF EMERGENCIES. MEDICAL, SURGICAL AND OBSTETRIC. THEIR PATHOLOGY, DIAGNOSIS AND TREATMENT. By J. Snowman, M.D., M.R.C.P.Lond. Second Edition. London: John Bale, Sons and Danielsson, Ltd. Pp. viii + 361. Price 10s. net.

In the preface of this handy little book we read that "the first edition of this manual was based upon the English edition of Lenzmann's 'Emergencies,' which appeared in 1914.

"This work dealt with the diagnosis, pathology and treatment of dangerous emergencies of sudden origin which threaten life. It therefore expressly excluded such injuries as fractures, dislocations and other morbid conditions not in themselves dangerous to life. Lenzmann's excellent scheme was closely followed by the present writer, but the text itself was entirely re-written, and the subject matter revised so extensively that the manual might fairly claim to be a new work, representing the teaching of standard British authorities on medical, surgical and obstetric emergencies. The exhaustion of the first edition, which was published in 1919, has afforded the opportunity for a further revision, in which considerable assistance has been rendered by Mr. L. Snowman, M.B., B.Ch.Cantab."

This is a small volume of some 360 pages and an index. It opens with descriptions of dangerous emergencies in disease of the respiratory system, followed by dangerous emergencies in disease of the heart, the nervous system, the gastro-intestinal tract, the urinary organs, acute poisoning, and finally dangerous emergencies in midwifery.

The general standard of the collective work is high and some of the special descriptions are excellent, but the treatment of cerebral syphilis, as given on p. 99, is not that now used in the Army. The author, in referring to the old clinic in Rochester Row, is apparently unaware that this famous military V.D. clinic was moved from Rochester Row three years ago, and re-established at the Royal Herbert Hospital, Woolwich, since when the treatment of syphilis in the Service has been considerably altered from that described in this book.

The article on intestinal obstruction is distinctly good and deals with a difficult subject from an essentially practical standpoint.

In a compressed text the varieties of obstruction are clearly discussed, and emphasis is duly laid on the life-saving value of early diagnosis and prompt surgery.

With the necessity for brevity always before him, our author has compressed in this little volume a most useful collection of information on medical and surgical emergencies. J. W. H. H.

Correspondence.

REORGANIZATION OF THE PATHOLOGICAL MUSEUM.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—During the last few years the Pathological Museum of the Royal Army Medical College has been reorganized, and many specimens have had to be discarded, as they have in course of time deteriorated to an extent which rendered them useless. Their replacement, more especially in the case of specimens illustrative of the pathology of tropical conditions, has been a matter of great difficulty. We are dependent on the help of officers stationed abroad for the supply of material of this nature, and we have thought that the best method of obtaining their assistance is through the medium of the *Journal*.

The following is the procedure advised for forwarding specimens: Where an organ or part of an organ is to be preserved it should be placed at once into Kaiserling solution, No. 1, for a period of up to five weeks, dependent on the size of the specimen. Kaiserling solution No. 1 is made up as follows:—

Formaldehyde	200 c.c.
Water (distilled)	1,000 c.c.
Pot. nitrate	15 grm.
Pot. acetate	30 grm.

When fixation is complete the specimen is removed from the solution, wrapped in cotton wool soaked in this fluid, protected by waterproof tissue and securely parcelled. The further processes will be carried out by the Curator of the Museum.

A brief clinical history of the case and the name of the sender for entry in the catalogue should accompany the specimens.

I am, etc.,

H. MARRIAN PERRY,
Lieut.-Colonel, R.A.M.C.
Professor of Pathology.

Royal Army Medical College,
Grosvenor Road, S.W.1.
April 22, 1926.

INDEX TO VOLUME XLVI.

C.N. = Clinical and other Notes.
C.L. = Current Literature.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Any demand for *reprints, additional to the above*, or for excerpts must be forwarded at the time of submission of the article for publication.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are inserted free of charge to subscribers. All these communications should be written upon one side of the paper only; they should by preference be typewritten; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "Journal of the Royal Army Medical Corps." War Office, Whitehall, S.W.1.

The Committee has sanctioned the publication of correspondence on matters of interest to the Corps, and of articles of a non-scientific character under a nom-de-plume. These communications must, however, be approved by the Editor before publication.

MANAGER'S NOTICES.

The Journal of the Royal Army Medical Corps is published monthly, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription for the Journal and Corps News Supplement is £1 (which includes postage), and should commence either on 1st July or 1st January; but if a subscriber wishes to commence at any other month he may do so by paying for the odd months between 1st July and 1st January at the rate of 1s. 8d. (one shilling and eightpence) per copy. (All subscriptions are payable in advance.)

Single copies can be obtained at the rate of 2s. per copy.

The Corps News Supplement is also issued separately from the Journal, and can be subscribed for at the rate of 4s. (four shillings) per annum, including postage. All subscriptions are payable in advance.

Subscriptions for the Corps News Supplement separate from the Journal cannot be accepted from Officers on the Active List unless they are also subscribing to the Journal.

Single copies can be obtained at the rate of 6d. per copy, excluding postage.

Cheques or Postal Orders for Subscriptions, etc., should be made payable to the "Hon. Manager, Journal R.A.M.C." and crossed "Holt & Co."

All communications should be addressed to The Hon. Manager, "Journal of the Royal Army Medical Corps," War Office, Whitehall, S.W. 1.

All Applications for Advertisements to be made to—
G. STREET & CO., Ltd., 8, Serle Street, London, W.C. 2.

Journal

of the

Royal Army Medical Corps

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

BREVET-COLONEL A. E. HAMERTON, C.M.G., D.S.O., R.A.M.C.

VOL. XLVII.

July—December, 1926.

JOHN BALE, SONS & DANIELSSON, LTD.
83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W. 1

No. 1. July, 1926. Vol. XLVII.

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

LIEUTENANT-COLONEL A. E. HAMERTON, C.M.G., D.S.O., R.A.M.C.

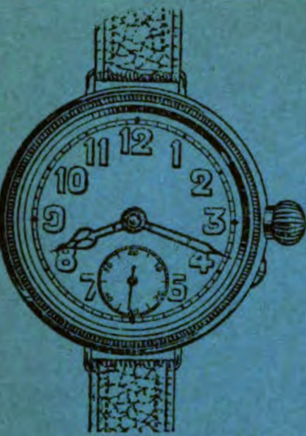
ISSUED MONTHLY

Printed and Published by

JOHN BALE, SONS & DANIELSSON, Ltd.

83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

Price Two Shillings net.



BY APPOINTMENT

The "Military" Watch

FITTED with a fine quality lever movement and contained in a one piece dust and damp proof screw case, this watch is of guaranteed reliability under the most exacting conditions of hard wear.

Fitted with luminous dial.

Silver.	9 ct. Gold.	18 ct. Gold.
£3.10.0	**£10.0.0**	**£12.10.0**

ILLUSTRATED CATALOGUE SENT UPON REQUEST

The
GOLDSMITHS & SILVERSMITHS COMPANY LTD.

Only Address

112, REGENT STREET, LONDON, W. 1.

(Corner of Glasshouse Street.)

***For* INDIGESTION *and* DYSPEPSIA**

Lactopeptine

LACTOPEPTINE IS A NON-SECRET REMEDY WITH ITS FORMULA ON THE LABEL OF EACH BOTTLE

THE digestive ferments (pepsin, pancreatine, diastase) used in the manufacture of Lactopeptine are of the highest grade. Although this preparation has been prescribed by the Medical Profession for over 40 years, its ingredients have been constantly improved and kept up to date by the most advanced pharmaceutical practice.

When prescribing specify in all cases Lactopeptine (Richards). Dispensed in 1 oz. (4/6) and ½ oz. (2/9) bottles, in powder or tablet form. To prevent substitution, Medical men are requested to prescribe Lactopeptine in original bottles.

Samples (powder, tablet and Elixir form) free of charge on receipt of professional card.

JOHN MORGAN RICHARDS & SONS, LTD.,
46 HOLBORN VIADUCT, LONDON, E.C. 1.

ELIXIR LACTOPEPTINE

A very palatable form of administering Lactopeptine combining the digestive properties of the latter with the stimulating effect of a pleasant aromatic tonic. Specially recommended.

Editorial.

It is with profound sorrow and with the sadness of farewell that we mourn in this month's Journal the passing of a great Director-General and a great friend. Sir William Leishman had many sides to his character and many and varied activities in his life, but none appealed so much to those of us who knew him well as his intense *esprit de corps* and his intense interest in all that concerned the welfare and reputation of those over whom he held sway. He retained through life the buoyancy of youth. He was not of those who, as years advance, are apt to become retrospective; to let to-morrow do its worst, for they have had their day. Leishman had no such Horatian view of life. Only a few days before his death he expressed disagreement with it in these memorable words: "The present age and my present life are of such intense interest and there is so much doing and so much to do that I have not begun to look back." No words could express better the quality of youth.

Obituary notices have already told the world of his contributions to science. He was one of those happy men to whom it was given to discern the causes of things. But great as was his scientific work, equally great was the spirit he infused into the Royal Army Medical Corps, when he became its Director-General; a spirit of unity; a spirit of earnest endeavour to maintain its reputation in every branch of work and play, and to rise above all forms of pettiness in word or deed. His love of and interest in all that is best in games from his student days onward were not generally known; but it was characteristic of him that only a few weeks before his death he undertook unselfishly the work of two of his staff to enable them to attend the Army Golfing Meeting at St. Andrews and bring back for the Corps the Regimental Challenge Cup. To all in the Corps he offered the same kindly, genial and loyal friendship. His life has been cut short, but we are the richer for having had him with us.

During a century of distinguished Director-Generals, only one other, Thomas Alexander, who held the appointment after the Crimean War, and in whose memory the Alexander Prize was instituted, died at his post. Memorials to Sir William Leishman will likewise be set up, but whatever may be their character, nothing will touch the Corps so nearly as that he entered its innermost heart and found, as few have done before him, a dwelling in it. There his memory will rest enshrined until we too have crossed the bar.

Photographed by Bassano, Ltd.

LIEUTENANT-GENERAL SIR WILLIAM LEISHMAN, KNT.,

K.C.B., K.C.M.G., M.B., F.R.C.P., F.R.F.P.S., F.R.S., LL.D., K.H.P.

VOL. XLVII. JULY, 1926. No. 1.

Journal
of the
Royal Army Medical Corps.

Obituary Notice.

LIEUTENANT-GENERAL SIR WILLIAM LEISHMAN, KNT., K.C.B., K.C.M.G., M.B., F.R.C.P., F.R.F.P.S., F.R.S., LL.D., K.H.P.

Director-General, Army Medical Services.

THE science of medicine, and the Corps he loved so well, have suffered an irreparable loss by the sudden death of Sir William Leishman. He was one of a small body of men who in a little more than two decades built up what we know as modern tropical medicine; his disciplined imagination, intense love of truth, and tenacity of purpose, enabled him to make discoveries which are known wherever the English language is spoken and esteemed by scientists of every nation.

Sir William Leishman was born in 1865 and was the son of Professor William Leishman, of the University of Glasgow. Professor Leishman was an author of great distinction, and his "Manual of Midwifery" was in the hands of most students of medicine some forty years ago.

Leishman was educated at Westminster School and received his medical training at the University of Glasgow, where he graduated M.B., C.M. in 1886. In 1887, at the early age of 21, he was gazetted Surgeon in the Medical Staff of the Army. His first foreign service was in India, and it was characteristic of him that he took a microscope with him, a most unusual proceeding in those days, and made good use of it there. He served in the Waziristan expedition, 1894-5, and received the frontier medal with clasp.

On his return to England he was posted to Netley, a most fortunate posting, for here he came under the influence of Sir Almroth Wright, whose lectures were an unceasing delight to the officers of the hospital, as well as to the surgeons on probation. In Wright, Leishman found a kindred spirit, and thus commenced an association in the preparation of antityphoid vaccine, which was to have a profound effect on the health of the soldier in peace and war.

Leishman was promoted to the rank of Major in 1899, and in 1900 succeeded Semple as Assistant Professor of Pathology in the Army Medical School. While working with Wright he prepared the stain which is now known everywhere by his name. It was a modification of Romanowsky's stain, and was evolved after many months of patient investigation, guided by a most acute and critical mind. By means of this stain the way to the discovery of the parasite of kala-azar was rendered possible. At a post-mortem examination of a soldier, who had died of this disease, Leishman made several smears from the spleen pulp and was able to demonstrate clearly the small parasite now known as the Leishman-Donovan body. This parasite is the cause of Indian kala-azar, and a similar parasite causes the Mediterranean form of the disease and also oriental sore. The group of diseases now bears the name "leishmaniasis."

At Netley Leishman perfected his method of estimating the phagocytic power of the whole blood, a most ingenious technique, which has been extensively used since in various researches.

On removal of the Army Medical School to London Leishman was appointed Professor of Pathology at the Royal Army Medical College in the place of Wright, who had accepted an appointment at St. Mary's Hospital. In London Leishman was largely occupied in teaching the various classes passing through the College, and those who were privileged to attend his lectures have even now a vivid recollection of his lucidity of expression and charm of diction. His powers were never better displayed than at a lecture on antityphoid inoculation which he delivered in the theatre of the College to the medical officers of all the European armies represented at the International Congress of Medicine, held in London in 1912.

While at the College Leishman instituted further researches in the preparation of antityphoid vaccine, which had been unfavourably reported upon in the South African War, and by improved technique and tests carried out on comparable groups of men both at home and in India he fully demonstrated the protective power of the new vaccine.

At the College also he continued his researches on kala-azar, a disease which greatly interested him. In one of his earliest publications he suggested that the parasite discovered by him "might be a stage in the life history of a trypanosome." If he had written "flagellate" he would have been correct, for only a little time later a telegram was received in the College laboratory from Rogers, in Calcutta, saying that he had succeeded in developing flagellates in a culture of the kala-azar parasite. Much of Leishman's spare time was spent in a laborious investigation into the fate of the spirochætes of relapsing fever in the tick. This work occupied him for some years, and owing to a masterly technique—a technique which was at once the admiration and the despair of his assistants and colleagues—he was able to demonstrate the granular phase of these spirochætes. Much of this work has been confirmed by Nicolle and his colleagues in their observations on the development of the spirochætes in

the louse. In 1920 Leishman gave a summary of his researches on this subject in the Horace Dobell lectures, which he delivered before the Royal College of Physicians, London, who had recognized his scientific work by appointing him a Fellow of the College in 1914.

Leishman remained at the Royal Army Medical College from 1903 to 1913. In 1905 he was made a Brevet Lt.-Colonel in recognition of his scientific investigations, and in 1909 he received the honour of knighthood. In 1910 he was elected a Fellow of the Royal Society, and in the following year served as President of the Society of Tropical Medicine and Hygiene. In 1911 he was promoted Lt.-Colonel, and in 1912 he was made a Brevet-Colonel and appointed Honorary Physician to the King.

On the formation of the Medical Research Committee of the Privy Council, Sir William Leishman, in view of his scientific standing, was at once appointed a member of the Committee, on which he served ten years and devoted immense labour to the institution and co-ordination of research work. In 1913 he became expert on tropical diseases on the Army Medical Advisory Board, and in this position was a source of inspiration to all research workers in the Army. After leaving the College he could rarely find time to return to actual laboratory work, and it was almost pathetic to see how he longed to employ again those skilled hands of his and with what regret he laid down his tools.

On the outbreak of war in 1914, Sir William Leishman was faced with the problem of protecting the first divisions which were ordered to France. There was not sufficient time to give the routine two inoculations, and the G.O.C.'s of the divisions were afraid that their troops might be incapacitated for exertion on reaching the war areas, where their services were urgently required in support of the French armies. Leishman convinced the generals that their fears were imaginary, and got over the difficulty of the two inoculations of antityphoid vaccine by giving a single dose of 1,000 millions to the divisions. Later on the practice of giving two inoculations was again resumed, and the triple vaccine against typhoid and the paratyphoid fevers was eventually prepared.

In October, 1914, Sir William Leishman proceeded to France and was appointed Adviser in Pathology on the Staff of the D.G.M.S. of the Expeditionary Force. In this capacity he was intimately associated with all the research work carried on in the various laboratories. He was Chairman of the Committees on Trench Fever and on Nephritis. He was a member of the Inter-allied Sanitary Commission, Paris, and of the Inter-allied Surgical Conference, Paris. Leishman was a good linguist, and was able to address these Committees in French—a great aid to the satisfactory discussion of the subjects brought before them. His headquarters were at Abbeville, and from there he visited our own and the French lines, and when the Americans landed in France he soon established friendly relations with them. By the time the critical stage of the war was reached his responsibilities were multifarious, and his satisfactory fulfilment of them made a splendid record of service.

He was mentioned in Despatches, *London Gazette*, February 17, 1915; May 29, 1917, and May 25, 1918; and for his services received the 1914 Star with clasp, British War Medal, Victory Medal, C.B. Military, Legion of Honour (3rd Class), and the American Distinguished Service Medal. In 1918 he was created a K.C.M.G.

In 1918 Sir William Leishman was brought home to the War Office to act as adviser to the then Director General, Sir John Goodwin, on the tropical diseases and pathological problems arising in the various theatres of war. On the formation of the Directorates of Hygiene and Pathology, he was appointed Director of Pathology, and remained in that appointment until 1923, when he was selected to succeed Sir John Goodwin as Director-General, Army Medical Services, with the rank of Lieutenant-General. Sir William Leishman took up this onerous post at a most difficult time; the changes from a war footing to peace organization necessitated a great reduction in staff and, owing to paucity in numbers and financial stringency there was great unrest in the Corps. While many regretted the break in his scientific career necessitated by his appointment as Director-General, it was felt that he would bring to that position the qualities he had already displayed in scientific fields. His infinite tact, sane outlook and breadth of view enabled him to perform his duties with the greatest distinction, and it will be a never-ending source of regret to all who knew him that he was cut off in the midst of his work, and just when so many of the problems and projects in which he was engaged gave promise of complete fruition. He would have been intensely gratified by the announcement made by the Prime Minister in the House of Commons that the recommendations of the Fisher Committee had been accepted by the Government.

After he became Director-General, he was created a K.C.B. and was promoted to the grade of Grand Officer of the Legion of Honour.

He greatly appreciated his election to the Athenæum Club at the end of last year on account of "eminence in science and public services."

Sir William Leishman served on many scientific committees. He was a member of the Yellow Fever Commission, West Africa, and of the Medical and Sanitary Advisory Committee for Tropical Africa at the Colonial Office; he was also a member of the Scientific Advisory Committee of the British Empire Cancer Campaign; and quite recently he was appointed Chairman of the Foot-and-Mouth Disease Research Committee of the Ministry of Agriculture. Just before his death he was elected President of the Section of Comparative Medicine at the Royal Society of Medicine. He much appreciated his re-election to the Medical Research Council this year.

In 1902 Sir William Leishman married the elder daughter of the late Lieutenant-Colonel E. Gunter, who survives him with one son and three daughters.

The funeral service was held in the Chapel of Queen Alexandra Military Hospital, Millbank; the Rev. A. C. E. Jarvis, Chaplain General to the

Forces, officiated and was assisted by the Rev. C. Thacker, Chaplain to the Hospital, and the Rev. P. McCormick, Vicar of Croydon. The Westminster Abbey Choir attended. The King and Queen and the Duke of Connaught were represented at the impressive service. The pall bearers were Lieutenant-General Sir Arthur Sloggett, Lieutenant-General Sir Hugh Jeudwine, Major-General A. A. McHardy, Major-General Sir William Macpherson, Surgeon Vice-Admiral Sir Joseph Chambers, Major-General G. J. Farmar, Air Vice-Marshal David Munro and Major-General J. W. O'Dowda. A battalion of Grenadier Guards with colours and band formed a guard of honour.

Numerous wreaths were sent and amongst other messages of sympathy and regret was one from the Pasteur Institute in Paris, signed by Professors Roux, Calmette and Martin.

Original Communications.

MENINGOCOCCUS SEPTICÆMIA.

By Colonel J. C. KENNEDY, C.B.E., M.D., K.H.P.
Consulting Physician to the Army.

In this communication four cases of septicæmia, presenting a definite clinical picture, are described. From the blood of three of them a Gram-negative diplococcus was isolated; this diplococcus was proved to be the meningococcus in two of the cases, while in the third case the organism rapidly died out in subculture and bacteriological proof is wanting, but clinically there seems no doubt of its identity, as the case terminated in meningitis. The similarity of the clinical symptoms of the fourth case justifies one in grouping it along with the other three under the diagnosis of meningococcus septicæmia.

In presenting these interesting cases I would particularly draw attention to (1) the long duration of the septicæmia in Case 1, viz., two years and four months; (2) the similarity of the clinical picture in all four cases; and (3) the presence of a rash, having the characters of erythema nodosum, which was an outstanding clinical feature, and offer the suggestion that there may be a specific relationship between erythema nodosum and meningococcus infection.

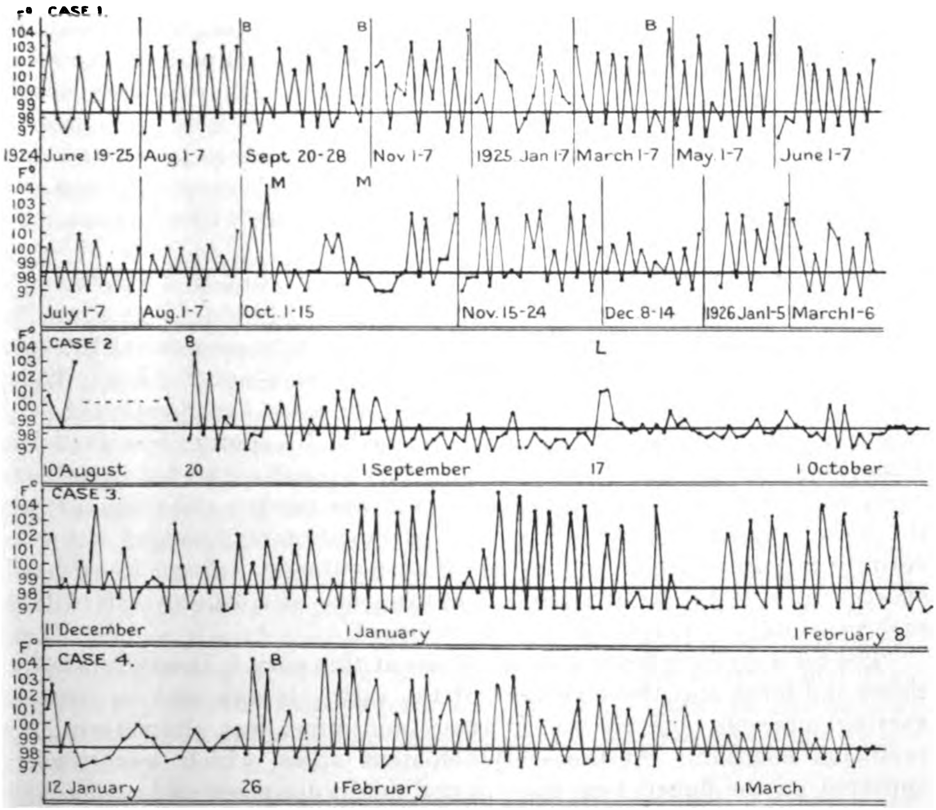
I should like to state at once that I have seen all these cases in the course of my consulting duties, but the collection of all the facts would have been impossible without the willing co-operation of the various medical officers and pathologists who investigated the cases, and to whom my acknowledgments are freely made.

Case 1.—Pte. R., Cameronians, aged 23. Onset: In the middle of December, 1923, he began to suffer from pains in the legs, chiefly in the calves and worse in the evenings, and accompanied by a feeling of general weakness and loss of appetite.

Admitted to 36 Casualty Clearing Station, Cologne, January 14, 1924. On admission it was noted that he had a papular rash on the trunk, limbs and face; the rash consisted of discrete raised spots of a dull red colour which faded on pressure. He was running a pyrexia of 101° to 102° F. every evening, accompanied by rigors and followed by profuse sweats, and his chief complaint was of pains in the joints and calves.

On February 14, a faint systolic murmur at the apex was noted for the first time, but there was no cardiac enlargement or circulatory disturbance. By March 1 the pyrexia became more marked with an evening temperature ranging about 103° to 104° F. The rash was still present and the limbs still painful. Every night he had profuse sweats. On March 11 blood and mucus was passed in a loose stool, but this did not recur.

His condition remained the same till his transfer to the United



EXPLANATION OF THE CHARTS.

Case 1.—As the chart is too long to reproduce in its entirety (total duration of disease two years and four months) extracts are given to show the character of the temperature throughout the illness. The extracts for July, August and December, 1925, represent the periods during which there was some amelioration of the symptoms.

B. Gram-negative diplococcus isolated from the blood.

M. Intravenous injections of mercurochrome, 20 and 10 c.c.

Case 2.—Unfortunately the temperature chart for the first ten days is missing, but the temperature is described as remittent during that period.

B. An organism isolated from the blood, which gave the cultural reactions of meningococcus but which could not be typed owing to its failure to produce agglutinins.

L. Onset of meningeal symptoms. Lumbar puncture. Cerebro-spinal fluid turbid.

Case 3.—After February 8 a great improvement set in and the chart thereafter shows an intermittent fever round about 99° F. with three definite rises to 101° F., accompanied by rigors, the last one on March 7. It was not till April 5 that the temperature settled down to normal. Blood cultures were unsuccessful.

Case 4.—Rigors began on January 26 and occurred every day on which the temperature rose to 101° F. or over.

B. Meningococcus, Type II, isolated from the blood.

Kingdom on June 17. During this period all clinical examinations proved negative. The liver and spleen were not enlarged and there were no physical signs in the chest or abdomen. Blood examinations showed a well-marked leucocytosis with a percentage increase in polynuclears; blood-cultures were negative. High agglutination reactions were accounted for by recent T.A.B. inoculation. Urine and fæces were negative and such sputum as could be obtained was negative to T.B. Wassermann test was negative and a thorough X-ray overhaul was likewise without result. He was diagnosed "pulmonary tuberculosis."

Admitted to Royal Herbert Hospital, Woolwich, June 18. At Woolwich it was noted that he was extremely thin and ill-looking with a muddy complexion but complained of nothing. The systolic murmur at the apex was considered to be functional, and the fingers were not clubbed. There was a definite nystagmus on lateral fixation and some exaggeration of deep reflexes. The cerebro-spinal fluid was normal. No sputum was available. There was a rise of temperature usually every second night, but sometimes every evening (see chart). A papular rash was coming and going all over the body. Again a careful systematic examination was carried out with entirely negative results and, in addition, melitensis, paramelitensis and abortus infections were excluded. The presence of a leucocytosis with a high percentage of polynuclears was confirmed.

The most striking feature of his illness at this period, if we exclude the rigors and fever, was the character of the rash. It appeared in crops at varying intervals, and on the forearms and shins was characteristic of erythema nodosum. At times erythematous spots, which were tender, appeared on the fingers near the tips and might disappear and reappear in the course of a day.

In order to obtain further opinion on the case, he was transferred to London with the note: "The condition suggests subacute bacterial endocarditis but no cardiac manifestations."

Admitted to Queen Alexandra's Military Hospital, Millbank, September 12. The note on admission to Millbank brings out nothing fresh. On September 20, "Rash persists. Temperature 101·8° F., pulse 116, regular. Respiration 28. Mitral systolic more marked than previously, but localized to apex and internal to it: no dilatation. He sweats freely each time his temperature goes up, which it usually does at 10 p.m. If he fails to sweat he does not feel well." It was astonishing how well the patient felt during the apyrexial periods. On this day a blood-culture was made by Lieutenant-Colonel Babington, who recovered a Gram-negative diplococcus in pure culture. The organism was extremely delicate and died out before its identity could be established, but its morphology was that of the meningococcus.

A similar organism was again recovered from the blood on September 28, but this also rapidly died out. From such cultures as were available, sufficient autogenous vaccine was prepared for three doses, 100, 200 and 300 million respectively.

During September and October he complained of pain in the abdomen and the right kidney region was tender on palpation: examination of the urine was negative; it contained a few leucocytes and a trace of albumin and was sterile in culture. During December the systolic bruit could not be heard, but it again became audible in January, 1925, and about this time he had attacks of conjunctivitis.

In March, 1925, he appeared to be a little better. His appetite improved and he slept well. His temperature, however, continued to reach 102° to 103° F. at night-time, often missing one day. On March 6 a Gram-negative diplococcus was again isolated from the blood, this time by Lieutenant-Colonel Bateman, and the same organism in association with a Gram-negative non-motile bacillus was obtained in culture from the centre of a papule excised from the arm. Yet again these organisms proved to be so delicate that most careful attention to subculture on a variety of media failed to preserve them, and a bacteriological diagnosis could not be definitely given. A section of the papule failed to demonstrate anything more than an excess of leucocytes in the blood-vessels. In April the rash was very marked and the temperature remained the same. In June he seemed to be getting a little better and the temperature was reduced to 100° to 101° F. In July he continued to improve and often went forty-eight hours without a rise of temperature. In fact, during July and August it looked as if he was recovering, but in September he relapsed and the temperature again occasionally rose to 103° F. In November and December improvement again set in and he began to get up in the evenings and even try to walk.

In January, 1926, he again relapsed, and the pains, rash, temperature and rigors again became aggravated. He steadily lost ground and became thinner and weaker. On April 6 he had a fit, with loss of consciousness for two minutes, preceded by headache, twitching of mouth, difficulty in speaking and swallowing and jerking of the right hand. It was obvious that the central nervous system was now becoming involved and his condition rapidly became worse. On April 27 he had another attack of twitching from which he never recovered.

Post-mortem Examination.—Unfortunately there was unavoidable delay in obtaining the necessary permission, and the examination was not carried out till twenty-five hours after death. Therefore it was anticipated that bacteriological examination might prove negative. The brain showed a definite leptomeningitis with turbid exudate in the pia-arachnoid, especially abundant at the base about the optic chiasma and along the sulci. There were two small purulent collections at the lower extremities of each sylvian fissure. The spinal meninges were also involved and the spinal fluid was under pressure. Cultures were negative and histologically the only positive finding was the evidence of a generalized polymorphonuclear exudate. The heart was very small, the walls of the auricles thin and the cardiac muscle in a condition of brown atrophy. The bases of the mitral cusps appeared

to be thickened, but when sectioned no evidence could be found of ulceration, vegetation or indeed any abnormality of the endocardium. The lungs, liver and spleen showed nothing macroscopically, but histologically there was fibrosis of the spleen with thickening of the walls of the arterioles and passive congestion of the liver. The bladder was enormously distended, and this probably accounted for a hydronephrosis of the pelvis of both kidneys. There was some vascular congestion, but except for cloudy swelling of the tubular epithelium there was nothing to note in the kidneys. The rest of the examination was completely negative.

Summary of Blood-Counts.—There was a progressive secondary anæmia.

Date	Leucocytes per c.mm.	Percentage of polynuclears
5.2.1924	25,700	..
2.3.1924	20,000	76·7
19.6.1924	24,000	81
9.7.1924	16,000	63
5.8.1924	21,200	..
11.9.1924	18,000	88
13.9.1924	23,600	77·5
20.9.1924	38,000	88
5.1.1925	42,400	83·5

Summary of Treatment.—It may be of interest to indicate some treatments that were given a trial. Quinine, iodine, collosal argentum, antistreptococcic serum, two courses of intravenous hydrarg. perchlor., 220 cubic centimetres polyvalent antimeningococcic serum, emetine, intravenous eusol, two doses of mercurochrome intravenously, stovarsol, injections of whole blood. The only drug that seemed to have any effect was mercurochrome, but that was very temporary (see chart) and was probably a depressant effect.

Case 2.—Farrier L., 26th Field Battery, R.A., aged 25. Admitted to Cambridge Hospital, Aldershot, on August 10, 1925. Onset: on the morning of August 5, while at work he suddenly felt giddy and had a headache and pain at the back of the neck. He went to bed and felt better but perspired freely. He remained in bed a few days because he felt giddy when he got up. On August 8, the left foot swelled up and spots appeared on the left leg; these were not itchy and were discovered accidentally.

On admission the temperature was 100·6° F. and he complained of headache and giddiness. There were a few spots on the arms and abdomen, more numerous on the legs and feet, and they were described as being like mosquito bites.

Course of illness: The temperature assumed a remittent character, rising to 103° F., and he complained of pain in the calves of the legs. Salicylates and quinine were administered. No malaria parasites were found in the blood.

On August 16 a blood-culture was sterile, but there was a leucocytosis of 17,000.

On August 18 a slight roughening of the first sound at the apex was

detected. The stiffness and pain in the calves was less, but fresh spots were still appearing.

On August 19 he was transferred to the acute medical ward as a possible case of endocarditis, and the following note was made: Temperature irregular, rising from normal to 103° to 104° F. in a few hours and subsiding as quickly; body, arms and legs covered with raised reddish papules like mosquito bites, some fresh, some fading, not itchy; face, palms and soles free; complains of cramp-like pains in the calves, but states that otherwise he feels quite fit except that he gets a headache when the temperature rises. Some roughening of first sound at apex. No rigidity of neck, reflexes normal. Urine contains a few pus cells, otherwise normal. There was a previous history of gonorrhœa, but no evidence now.

On August 20 a Gram-negative diplococcus was isolated from the blood by Lieutenant-Colonel Babington; this organism was morphologically a meningococcus and was agglutinated by a stock anti-meningococcus serum (Lister), but not by type sera 1, 2 or 3 (see bacteriological report). The irregular temperature continued and fresh spots appeared from time to time, but about the end of the month there was a considerable improvement (see chart) and on September 4 he was allowed up. From this date to September 17 the temperature remained normal except for two slight rises on the 8th and 11th.

On September 13 the leucocyte count was 15,000, with 79 per cent of polynuclears. He was extremely anxious to be allowed out of hospital, but he still had some spots and did not look well though nothing definite could be made out clinically.

On the afternoon of September 17 he felt sick and, after vomiting, collapsed. The temperature rose to 100·8° F., pulse was 108 and he looked very ill. He complained of stabbing pain between the upper neck vertebræ and stiffness, he was slightly delirious and had some photophobia.

On September 18 there was intense headache and definite rigidity of the muscles of the neck, but no Kernig sign and the reflexes were normal. Lumbar puncture produced a turbid fluid under fair pressure, numerous polynuclears were present in the cerebro-spinal fluid but no organisms were found; forty cubic centimetres of cerebro-spinal fluid were drawn off and twenty-five cubic centimetres anti-meningococcic serum injected intrathecally.

He was transferred to the Military Isolation Hospital, where he was treated with antiserum as a case of cerebro-spinal meningitis. He made a rapid and uninterrupted recovery and was discharged from hospital on November 3.

Case 3.—Private P., 2nd Leicester Regiment, aged 23. Admitted to Military Hospital, Colchester, December 11, 1925. Onset: The illness began when he was on leave in November with a feeling of "cold all over" and feverishness: he went to bed and felt better next day. A day or two later the symptoms recurred and he noticed a rash which began on the flexor

surfaces of the arms and extended to the abdomen and chest. He felt out of sorts for several days and reported sick on his return to Colchester.

On admission he had a well-defined macular rash on the chest, abdomen and extremities which, it is stated, was pustular in parts. Temperature 102° F., pulse 112. There were vague symptoms of tenderness in the feet and slight œdema in the right foot. Clinical examination was entirely negative. He was diagnosed erythema nodosum and given salicylates. Next day, following a profuse perspiration, the temperature fell to normal.

On the fourth day the temperature rose to 104° F., was normal the following day and two days later again rose to 101° F. Thereafter the temperature became remittent, varying from subnormal to 103° to 104° F. (see chart). Practically every rise of temperature was accompanied by a rigor, terminated in a sweat and was followed by prostration and depression. The urine and prostatic secretion were normal. There were no parasites in the blood. The leucocyte count on January 2, 1926, was 24,800 (polymorph neutrophils 72 per cent), on the 5th 18,600 (polymorph neutrophils 73 per cent), and on the 16th 10,400 (polymorph neutrophils 81·5 per cent). Blood-cultures on January 5 and on two subsequent occasions were negative. Agglutination tests did not throw any light on the diagnosis and the Wassermann reaction was negative. Microscopic and cultural examinations of the fæces were completely negative.

On January 28 anti-meningococcic serum was given intravenously without effect, but the dose was only twenty cubic centimetres.

After February 8 a very distinct improvement set in and during the following ten days only two rises of temperature with rigors occurred.

On February 20 fifteen cubic centimetres of mercurochrome were given intravenously. This was followed by severe mercurialism which subsided after twenty-four hours. Thereafter the temperature, though frequently rising to 99° F., gradually settled down and only one more rigor occurred, on March 7, when the temperature rose to 100·6° F. Since April 7 the temperature has been normal and the patient is now convalescent.

During the course of the illness there was detected in the mitral area a roughening of the first sound which at times amounted to a bruit, not propagated; but there were no physical signs of cardiac enlargement. The symptoms were strongly suggestive of acute rheumatic fever, in so far as the severe generalized pains that frequently accompanied a rise of temperature appeared to be relieved by salicylates, which seemed to reduce the temperature, promote sweating and induce sleep.

Case 4.—Gunner T., 99th Field Battery, R.A., aged 19. Admitted to Cambridge Hospital, Aldershot, January 12, 1926. Onset: He returned from furlough on Boxing Day, 1925, and felt perfectly well until January 10, 1926, when he felt as if he "wanted to vomit at any minute." Next day he felt better. On January 12 he again "felt sick and very weak in the legs, as if he might drop down," and was admitted to hospital.

On admission he had a slight sore throat with some tonsillitis on the

right side but no patches, headache across the forehead, malaise, aching of legs and arms and slight coryza; there were also a few papular spots over the lower surface of the tibia. Temperature 102° F.

After forty-eight hours in bed with local treatment to the throat and sod. sal., ten grains four-hourly, he appeared so much better that it was thought he had an influenzal type of infection and was cured.

After another two days—five days after admission—his temperature started swinging to 100° F. and over; the headache, pain in limbs and rash all returned.

On January 26 he had a definite rigor and the temperature rose to 104·8° F., but fell to normal in a few hours.

On January 28 a Gram-negative diplococcus was isolated in blood-culture by Lieutenant-Colonel Babington and was subsequently proved to be meningococcus Type 2. The leucocyte count on January 28 was 19,000 and on March 22 12,000. He continued to have rigors daily. The rash was, at times, all over the body, but chiefly over the lower limbs and abdomen and consisted of erythematous and dusky papules about one inch in diameter. There were no physical signs to be found anywhere apart from the rash and a small palpable gland in the right submaxillary region. The spleen was not palpable.

About February 13 a few crepitations were heard over the upper lobe of the right lung at the back, but the sputum was examined five times for *T.B.* with negative results. The course of the disease may best be seen from the chart. He was treated with hexamine, ten grains, t.d.s., from February 1 to 16, but as some blood was observed in the urine on the latter date sod. bicarb. was substituted.

On February 17 he was asked if he felt like getting up and replied that he did. He was, therefore, allowed to get up whenever he felt inclined and given a liberal diet rich in vitamins. From the time he was allowed to get up and placed on sod. bicarb. he gradually improved and is now convalescent.

A striking feature in all these cases was that during the apyrexial periods they felt extraordinarily well.

Bacteriology.

Case 1.—A Gram-negative diplococcus was isolated from the blood in pure culture on three occasions by two observers, and a similar organism was obtained in culture from the centre of a papule which had been excised from the arm. From the papule a Gram-negative non-motile bacillus was also obtained in culture which on subculture became chromogenic. The morphology of this diplococcus both from the blood and the papule was that of the meningococcus, but serologically it could not be identified owing to its failure to grow in subculture. In the original blood broth culture it was eight days before any growth could be detected and subcultures on Fildes' medium became visible only after forty-eight hours. It

is realized that bacteriologically the gonococcus has not been excluded; but there was no history or any evidence of this infection. The termination by meningitis and the findings at the autopsy confirm the diagnosis.

Case 3.—All cultures have been negative.

Cases 2 *and* 4.—The following report is submitted by Lieutenant-Colonel H. M. Perry, Professor of Pathology, R.A.M. College:—

INVESTIGATION OF TWO CULTURES LABELLED "LONG" (CASE 2) AND "THORNETT" (CASE 4), SUBMITTED BY LIEUTENANT-COLONEL BABINGTON.

These organisms were reported to have been obtained by blood-culture.

Morphological Appearance.—Film preparations of both strains showed the organisms to be diplococci, the opposed surfaces of the bacterial elements being flattened; a few distinct tetrads were evident, but the general arrangement was in pairs. No tendency to the formation of chains was demonstrable. In cultures a few days old involution forms were common, swollen, indifferently staining cocci being a feature. Both organisms stained readily, but failed to retain the stain when Gram's method was applied.

Cultural Characteristics.—The organisms showed some contrast in their ease of cultivation. Strain "Long," which had been isolated some weeks before, produced a fairly luxuriant growth on trypagar, blood agar, and on Fildes' medium. Strain "Thornett," isolated more recently, whilst growing on the above media produced a more scanty growth. Both strains failed to grow in ordinary nutrient broth. The optimum temperature for cultivation was 37° C., and growth did not occur below 25° C.; the organisms died out rapidly at room temperature. For preservation of the strains subculture at intervals of a few days was necessary.

Character of Colonies.—Isolated colonies were raised and translucent with an even margin, they emulsified readily in saline.

Biochemical Reactions.—The fermentative property of the organisms was tested on glucose, saccharose and maltose in Hiss's serum water medium. Both strains produced acid in glucose and maltose after four or five days' incubation at 37° C. The failure to ferment saccharose was controlled by cultural test.

Serological Tests.—Agglutination tests against the four type-meningococcal agglutinating sera yielded the following results: Strain "Long" failed to show any evidence of agglutination with any of the type sera. Strain "Thornett," whilst failing to agglutinate with Types 1, 3 and 4 sera, was definitely clumped up to a dilution of 1 in 125 by the Type 2 serum. Two rabbits were immunized, one with strain "Long," the other with strain "Thornett." A series of eight inoculations of emulsions of the organisms in increasing doses was given over a period of two months before any evidence of agglutinin production became evident. At the end of this

period the serum of the animal inoculated with strain "Thornett" yielded the following agglutination results:—

	Agglutination titre
Against strain "Thornett"	1 in 250
,, ,, "Long"	*Nil*
,, Types 1 and 4 meningococcus	*Nil*
,, Type 2 meningococcus	1 in 1,000
,, ,, 3 ,, ...	1 in 125

The serum of the animal inoculated with strain "Long" failed to show any agglutinins for the homologous organism, strain "Thornett," or any of the type strains of meningococci.

From the above investigation it is concluded that strain "Thornett" is closely related to, if not identical with, Gordon's Type 2 meningococcus, whilst strain "Long" culturally and biochemically resembles a meningococcus, but cannot be serologically identified owing to its failure to elaborate agglutinins.

Discussion.

The evidence for grouping these four cases together as examples of meningococcus septicæmia, though incomplete, can hardly be gainsaid.

The clinical picture presented by the type of fever, the rigors, the peculiar rash and the absence of any discoverable focus, is identical in all. Two of them terminated with meningitis (one fatally), and in both of these the blood contained a Gram-negative diplococcus, which in one case was identified biochemically as a meningococcus. Cases 3 and 4 which recovered without meningitis were identical clinically and from the blood of one, meningococcus, Type 2, was recovered.

The three organisms isolated showed the same delicacy of growth and lack of resistance, though to a varied degree, and all failed to be agglutinated by the respective patient's serum. It was only after the injection of massive doses of antigen that an agglutinating serum for strain "Thornett" could be produced, while the same procedure in the case of "Long" failed.

These bacteriological difficulties have already been noted in reports of similar cases of meningococcus septicæmia.

It would appear from the literature that it is Type 2, or according to French nomenclature the parameningococcus, that is usually associated with the septicæmic disease in which, it should be noted, skin, joint and eye manifestations have frequently been observed. Rolleston (1919), in his excellent summary of the whole subject, quotes the opinion expressed by many observers, but in particular the French, that this type has become more prevalent since the Great War and the increased frequency of meningococcæmia may thus be explained.

The work of Gordon and others suggests that, from the bacteriological point of view, Type 2 represents a group of closely-allied organisms which vary in their antigenic values. This variation appears to fall into line with

the variety of its clinical manifestations, which include not only the fulminating and purpuric form of septicæmia as well as the more chronic form now under discussion, but also the classical epidemic cerebro-spinal meningitis.

Meningococcæmia has been recognized for a long time and may be considered an essential stage, however brief, in the development of cerebro-spinal meningitis; but the type of prolonged septicæmia, of which the cases described above are examples, is sufficiently rare or perhaps so rarely recognized that it warrants some attention.

Rolleston (1919) classifies meningococcus septicæmia under the following headings:—

(1) Fulminating. Rapidly fatal before meningitis has had time to develop and accompanied by extensive hæmorrhages into the skin.

(2) Abortive.

(3) Intermittent meningococcic fever due to septicæmia, which may
- (*a*) last for weeks without meningitic symptoms following,
- (*b*) follow meningitis,
- (*c*) show transient meningitic symptoms, or
- (*d*) terminate in meningitis.

Morgan (1921) classifies meningococcic infections under three headings:—

(A) Fulminating meningococcus septicæmia.

(B) Acute meningococcus septicæmia. This is synonymous with epidemic cerebro-spinal meningitis.

(C) Chronic meningococcus septicæmia.

It will be seen that the cases now reported fall into Morgan's C group or Rolleston's 3 (*a*) and (*d*). The latter writer quotes cases under 3 (*a*) lasting four to five months and says: "The attacks of fever may be quotidian or tertian and in the intervals the patient may feel well."

Considering the very extensive literature on the clinical aspects of meningococcus infection, comparatively few cases of the chronic septicæmic type have been reported.

In this country, since 1919, I have traced only two.

Gulland (1925) reported a case of prolonged meningococcæmia with terminal meningitis in which the organism was Type 2.

Findlay (1919) reported a case with twenty days' fever without meningitis, but this case hardly comes into the same category, as the fatal termination was due to meningococcic pericarditis.

In America, Morgan (1921) described two cases, one with fifty-six days' fever before the development of definite meningitis and the other of a month's duration. Blœdorn (1922) and Dock (1924) each describe one case, and the latter writer summarizes sixty-eight similar cases that he had collected from cosmopolitan literature.

Reference is made by several of the above writers to French observers whose experience of this type of septicæmia would appear to be more extensive.

The fact that these four cases have all occurred in the military population, and three of them (excluding the Cologne case) in the space of six months, is evidence that this septicæmia must be more prevalent in the community as a whole than one is led to believe. One would suppose that cases terminating in meningitis could hardly fail to be recognized, and it is surprising how little reference to such cases is to be found in current literature. With cases of pure septicæmia, however, the matter is different and it is not surprising that they should be missed, even though some of them on critical examination would fall into Rolleston's group 3 (*c*). Without blood-culture diagnosis is impossible, and I suggest that these cases are being diagnosed under one or other of the following diseases: malaria, septicæmia, subacute bacterial endocarditis, rheumatic fever, tuberculosis, erythema nodosum.

My interest is centred for the moment on the last-named disease, but it may not be amiss to take each of these diseases in turn and indicate briefly the points of similarity with meningococcus septicæmia.

Malaria.—Cases have been reported by the French (quoted by Rolleston) which have closely simulated the tertian or quartan type of fever, and when this is associated with rigors and sweats the similarity is obvious.

Septicæmia (undifferentiated).—This non-committal diagnosis is not surprising when it is considered that the only way to diagnose the disease is by blood-culture, in which, moreover, it is not always easy to isolate the meningococcus. Case 1 was cultured five times before a positive result was obtained, and in one of Morgan's cases the meningococcus was isolated only on the sixth attempt.

Subacute Bacterial Endocarditis.—This diagnosis is a very likely one. It has been noted in three of the cases reported above that cardiac bruits were present, and in two of the cases a diagnosis of endocarditis was favoured by several medical officers. In Case 1, which was definitely diagnosed endocarditis at one time, there was no evidence of this found at the post-mortem examination, but during life, in the face of the physical signs, it was not possible to exclude a lesion of the endocardium. Cardiac bruits have frequently been noted in similar cases. It must be remembered, however, that meningococcus endocarditis may occur, but fortunately it is rare.

Rheumatic Fever.—When we consider that with the temperature and rigors there are profuse sweats and rheumatic-like pains and swellings, and in addition a rash which has come to be associated with rheumatic infection, it is not to be wondered at if many cases are diagnosed rheumatic fever. The pains in the calves may be distressing; they are described as cramps or as myalgic in character. The swellings are generally peri-arthritic and transient. Synovitis has been described and the meningococcus has been isolated from the synovial fluid.

Tuberculosis.—Like rheumatism, tuberculosis is a disease with which the characteristic erythematous rash has come to be associated. The frequency with which physical signs may be demonstrated in the absence

of active tubercular disease of the lungs is a diagnostic factor to be reckoned with when one is dealing with an obscure febrile condition associated with an erythematous rash.

In two of the above cases pulmonary tuberculosis was seriously considered and many attempts were made to isolate the bacillus from such sputum as could be obtained. A case has been reported in which pulmonary tuberculosis and meningococcus septicæmia co-existed.

Erythema Nodosum.—The most striking clinical feature in the four cases now reported was, to my mind, the very definite and characteristic rash.

The rash may best be described as a recurrent erythema multiforme, distributed sometimes over the whole body but showing a predilection for the limbs. On the forearms and the shins particularly it was characteristic of erythema nodosum. The intensity of the rash tended to be in proportion to the severity of the fever and was obviously a septicæmic manifestation. In this connexion the culture of the organism from the centre of an excised papule or nodule is of interest.

Morgan, in discussing his two cases, states: "The most characteristic single clinical finding in the cases reported has been the painful erythematous nodules which appear in crops, and which, on disappearing, do not leave the well-marked bluish discoloration of the skin so constant in erythema nodosum." And again: ". . . the dominant finding is a raised, firm, nodular, red or bluish-red lesion varying in size from 0·25 to 2 centimetres in diameter and usually tender. These lesions appear in crops and gradually disappear, only to recur in the course of a few days."

The association of erythema nodosum with meningococcus infections has been noted by several observers (Osler, Rolleston, and others, notably the French).

Symonds (1917) described a somewhat similar rash in the early stages of cerebro-spinal meningitis and called it a premeningitic rash.

There is no doubt that too little attention has been paid to the association of this particular form of rash with meningococcic infection, particularly the septicæmic disease, and in consequence a valuable aid in the diagnosis of these cases has been neglected.

Much has been written on the rheumatic or tubercular origin of erythema nodosum and these theories still wield an influence. The first time I saw Case 1 the characteristic appearance of the rash on the shins at once suggested rheumatism or tubercle. Similarly, on admission to hospital, Case 3 was diagnosed erythema nodosum and placed on salicylates; on the following day when the temperature had fallen to normal the case was demonstrated as a typical example of rheumatic erythema nodosum.

We are apt to forget that these theories have been subject to criticism and found "not proven" (Gosse, 1913; Whyte, 1915; Symes, 1921); and the position as regards the ætiology of this skin manifestation is well expressed

in Osler and McCrae's "System of Medicine" (1915, i, 997). In fact the tendency of the present day is to regard erythema nodosum as a specific infection. Lendon (1905) applied the term "nodal fever" to febrile erythema nodosum, considered it to be a specific infection, and brought forward evidence of its infectivity, evidence which has been added to by subsequent writers. Lendon's clinical descriptions warrant the conclusion that a diagnosis of meningococcus infection would be justified in many of his cases, and I suggest that Lendon's nodal fever is synonymous with meningococcus septicæmia.

On looking up some of the literature on the relationship of tubercle to erythema nodosum, I was struck by the fact that, here again, the clinical description of many of the cases undoubtedly is suggestive of meningococcal infection.[1]

That there is a relationship between erythema nodosum and meningococcal infection is undoubted, but the extent or specificity of this relationship has yet to be determined. Meanwhile I wish to emphasize this point: *Given a case of erythema nodosum, suspect meningococcus infection,* and I would urge medical officers to bear this in mind and make careful blood-cultures in all cases of erythema nodosum.

Evidence is already forthcoming that this point of view should be followed up. When perusing some medical reports recently submitted to the War Office for the year 1925, I noticed a case that had been diagnosed "? rheumatic fever." This was a boy aged 15, and the symptoms were: severe headache, drowsiness, photophobia, slight discharge from the eye, pain on flexing the head, but no definite Kernig, *erythema nodosum on the shins* and a temperature remitting between 99° and 101° F. for twelve days. A request for further information from the medical officer elicited that "The clinical picture would certainly support a diagnosis of meningeal infection." The necessary confirmation is of course lacking, but it would appear that this was a case of meningococcæmia falling into 3 (*c*) of Rolleston's classification. There can be no doubt that the true significance of such cases is seldom appreciated, especially when they occur sporadically.

I feel sure that with a realization of the diagnostic significance of erythema nodosum in relation to meningococcus infections, many more cases of meningococcus septicæmia will be brought to light.

ACKNOWLEDGMENTS.

To the Officers Commanding the Queen Alexandra Military Hospital, Millbank, Cambridge Hospital, Aldershot, and Military Hospital, Colchester.

To Lieutenant-Colonels M. H. Babington and H. R. Bateman for the use of their laboratory reports.

---

[1] A critical survey of the literature on erythema nodosum is contemplated.

To Lieutenant-Colonel H. M. Perry, Professor of Pathology, for his reports on the bacteriology and morbid histology.

To Major A. M. Benett and Captains E. B. Marsh, D. W. Beamish, T. Menzies, W. H. Ferguson and F. Holmes for their clinical notes.

REFERENCES.

BLOEDORN. *U.S. Naval Med. Bull.*, 1922, xvi, 855.
DOCK. *Journ. Amer. Med. Assoc.*, 1924, 83, i, 31.
ELLIS. JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, 1916, xxvi, 64.
FINDLAY. *Journ. Roy. Nav. Med. Serv.*, 1919, 198.
GORDON. JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, 1915, xxiv, 455.
Idem. *Ibid.*, 1918, xxx, i.
Idem. "Medical History of the War. Diseases," vol. i, 1922.
Idem. *Ibid.*, "Pathology," 1923.
GORDON and MURRAY. JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, 1915, xxv, 411.
GOSSE. *Practitioner*, 1913, vol. cxi.
GULLAND. *Brit. Med. Journ.*, 1925, i, 687.
LENDON. "Nodal Fever," London, 1905.
MORGAN. *Bull. Johns Hopkins Hosp.*, 1921, xxxii, 245.
OSLER. "System of Medicine," Tenth Edition, 1925.
OSLER and MCCRAE. "System of Medicine," 1915, i, 997.
ROLLESTON. *Lancet*, 1917, i, 55.
Idem. Lumleian Lectures, *Lancet*, 1919, i, 541, 593, 645.
SYMES. *Brit. Med. Journ.*, 1921, ii, 741.
SYMONDS. *Lancet*, 1917, ii, 86.
TULLOCH. JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, 1917, xxix, 66.
Idem. *Ibid.*, 1918, xxx, 115.

SOME GUIDING PRINCIPLES IN THE EVACUATION OF CASUALTIES.[1]

By Major T. J. MITCHELL, D.S.O., D.A.D.G., War Office.
Royal Army Medical Corps.

I propose to confine my attention to the questions suggested to me by Colonel Needham, and I have purposely excluded all detail in connexion with organization, as I recall a lecture given by an eminent zoologist, in the course of which he remarked that if he wanted to know the exact number of scales on any fish he could always find it in a text-book. I prefer rather to discuss with you the practical Staff problems that crop up daily, the majority of which are not mentioned in the textbooks.

May I remind you that medical officers during times of peace are perhaps more interested in their purely professional work ; they do not pass through any Staff College or course in Staff duties ; and if by chance they occupy a Staff appointment the sympathy and help they receive from the Staff College graduate are both encouraging and instructive. This is especially so on active service, when it would always be a help if the Staff officer were to explain briefly and simply to the administrative medical officer the details of any operations in which the force is likely to be engaged.

It was from the Staff College, too, that medical strategical and tactical problems first saw the light of day. Twenty years ago ideas on the subject were rather chaotic, but fortunately at that time there was in the Medical Service an enthusiastic officer who had studied the systems of evacuation in continental armies and who had been a British representative in the Russo-Japanese War. I refer to Major-General Sir W. G. Macpherson, who ultimately held the office of Deputy Director-General in France during the Great War, and subsequently was Editor-in-Chief of the official "Medical History of the War." In 1907 he was invited by the Staff College to lecture on the evacuation of casualties, and he was therefore forced to crystallize his ideas on the subject. These ideas, clothed in official language, became the regulations which guided us during the Great War.

As a result of the experience gained in the different campaigns, the Medical Service has endeavoured to put its house in order; its organizations have been revised; its official Medical History of the War has been published; a revised edition of its Training Manual has been issued; and its regulations have been reviewed and will appear shortly in the new edition of the soldier's Bible, Field Service Regulations.

---

[1] A lecture delivered to the Staff College, Camberley, on March 27, 1926.

I am asked to commence with a general outline of the Medical Service as it is organized for war at the present time.

General Outline of Medical Service.

The responsibilities laid upon the Medical Service of an army in the field comprise:—(1) advice to commanders regarding the maintenance of the health of the troops and the prevention of disease; (2) the collection, treatment and evacuation of the sick and wounded; (3) the administration of medical units; and (4) the supply and replenishment of medical stores and equipment.

Underlying this service are the principles that to fight well the troops must be fit, and that having fought and become casualties they must have their sufferings alleviated as soon as possible, and be evacuated as quickly and as comfortably as the conditions of warfare permit. Not only can forethought and prevention stay the spread of disease, which in epidemic form can decimate an army more effectively than any human enemy, but a rapid evacuation of casualties from the battlefield inspires confidence in the men, keeps up their *moral* and gives the fighting force greater mobility. Such a system of evacuation must be complete in every detail and so constituted as to stand the test of war.

Take then a battlefield and watch the progress of the wounded from front to base, and in imagination add to the picture all the difficulties attendant upon modern warfare. During the chaos of battle the regimental stretcher-bearers administer first aid to the wounded and carry them to shelter or to the medical aid post nearest to the firing line. This first stage in the chain of evacuation is called the Regimental Aid Post. It is generally situated in some position, dug-out or other shelter near unit headquarters, so that the medical officer in charge of the establishment may be kept in constant touch with the trend of events. Here the wounded are sorted out, and those who are able to walk are despatched with or without a guide to the advanced dressing-station (A.D.S.), or to the walking wounded collecting post, if there is one, where they receive medical attention.

The more seriously wounded are conveyed by the bearer personnel of the field ambulance, either by hand stretcher or by wheeled stretcher carrier, from the regimental aid post to the A.D.S., which is formed as far forward as operations allow and with due regard to facilities for road transport. Here these cases have their first field dressings adjusted, and are revived by hot drinks and bodily warmth before being conveyed by the field ambulance road transport to the next stage in their evacuation, the main dressing station (M.D.S.).

Main dressing stations are formed by the headquarters of the field ambulances, and as they are situated further back, they enjoy a somewhat greater protection and can offer the wounded better accommodation. Only very urgent operations are performed here. Dressings are adjusted,

and the necessary clerical entries in connexion with the records of admissions are made.

Motor ambulance convoys ply between the M.D.S. and the casualty clearing stations, which form the first hospital link between the front and the base. Casualty clearing stations must have good road communication with the M.D.S. and be within easy access of the ambulance trains at railhead. During the early part of the Great War they acted more as distributing centres for the hospitals on the lines of communication and at the base, but subsequently they acted as hospitals, where important operations were performed and skilled treatment was given to the wounded.

Casualties who require no further active medical treatment and are likely to recover within a short time are transferred from the C.C.S. to an advanced convalescent depot in the particular area, whence after a short period spent in the recuperation of their health and strength they are sent back to duty. Cases requiring further medical treatment are conveyed from the casualty clearing stations to the general hospitals on the lines of communication and at the base.

Many methods of distribution are employed from casualty clearing stations, e.g. :—

(1) Motor Ambulance Convoy.

(2) Ambulance Train.

(3) River Steamer and Ambulance Barge on inland waterways and canals, if the nature of the country permits.

From the general hospitals at the base to hospitals out of the area of operations or overseas, evacuation is effected by ambulance train, hospital carrier, hospital ship or ambulance transport.

Such in outline is the system of the evacuation of casualties from the battlefield. In theory it seems quite simple. To be a success in practice, it requires close co-operation and sympathetic understanding between the Medical Service and those other services of the Army upon which to a very large extent it is dependent.

Field Ambulance.

As it is the disposal of divisional wounded in mobile warfare that specially interests you at present, let us consider the main medical unit in the division, the *Field Ambulance.* There are three field ambulances to a Division, and one to a Corps, and their rôle is twofold :—

(1) To clear the R.A.P. of casualties.

(2) To form dressing stations.

The field ambulance is organized into: (1) headquarters; (2) two companies. The headquarters holds the more elaborate medical and surgical equipment and the bulk of the ordnance equipment as it forms the M.D.S. The companies, which are self-contained in personnel, equipment and transport, form the A.D.Ss. The transport available for the carriage of wounded is as follows :—

	Carrying capacity: Lying-down cases		Sitting cases	Mixed cases
4 heavy horsed-ambulance wagons ..	16	or	48	or 8 lying and 16 sitting
6 light motor ambulance cars ..	12	,,	18	—
2 heavy motor ambulance cars[1] ..	8	,,	12	—
Total ..	36	,,	78	

[1] A special type for service use is under consideration at the War Office.

The field ambulances are divisional units and are opened or closed by the A.D.M.S. of the Division. Any change in their situation is notified to the division, brigades and medical units. The A.D.S. is usually situated near Brigade Headquarters and the M.D.S. in the vicinity of Divisional Headquarters. This is only a rough guide, but I ask you to remember it. Its importance will be discussed later.

If the A.D.M.S. decides to open one A.D.S. only, the second company of the field ambulance remains with headquarters at the M.D.S. ready to go forward, either to reinforce the A.D.S., if required, or to relieve it.

Nominally the field ambulance is equipped for 150 patients, the total accommodation therefore for the division being 450, but as you all probably know the field ambulance is often called upon to deal with greater numbers, and its powers in this direction depend upon the *system of evacuation established.*

Casualties retained in a field unit are impedimenta to mobility during an advance and must be evacuated to medical units in the rear of your force. It is only possible to retain casualties in field units:—

(1) During intervals between battles.

(2) During prolonged halts.

(3) During quiescent periods of defensive warfare.

(4) When the Division is enjoying a complete rest from fighting.

The neglect or ignorance of this simple elementary principle is well illustrated in the history of the Mesopotamian campaign. In practically the first battle of the campaign no system of evacuation had been worked out, and at the battle of Sahil the G.O.C.'s orders were: "Sick and wounded will be carried with the force by these medical units." This order was responsible for many subsequent hardships and failures as it initiated a pernicious system which recurred again and again, e.g., at the first battle of Kut-el-Amara, at Ctesiphon and at Dujaila Redoubt.

In my opening remarks I gave you an outline of the course of a wounded man from the R.A.P. backwards. Let us examine the methods of evacuation more in detail. Within the divisional area we have two stages: (1) from the R.A.P. to the A.D.S., and (2) from A.D.S. to M.D.S.

In the first stage the cases are evacuated by one of four methods:—

(1) By walking.

(2) By stretcher, carried by the bearers from the A.D.S.

(3) By wheeled stretcher carrier (six per field ambulance) or by trolly if a tramline has been laid.

(4) Occasionally by wheeled transport coming right up to the R.A.P.

Before we can use the last method we must have the decision of the brigade or division because the use of wheeled transport may draw the attention of the enemy to your positions.

In the second stage five methods are open to us:—

(1) *Horse or motor transport*	Divisional transport.
(2) 'Buses, lorries or empty supply wagons[1] ...	Extra divisional transport.
(3) Light railway	
(4) Motor ambulance convoys, occasionally ...	
(5) Launches and other forms of transport	

The broad fact to remember is that divisional transport is ordinarily used for the evacuation of cases back to the M.D.S., but in an emergency, or when casualties are heavy and it is essential to free the area, extra divisional and medical transport are sometimes used.

I have already given you the transport, horse and motor, that is laid down at present in our war equipment tables, but may I quote you a few lines regarding transport from the new F.S.R. that will shortly be published?

"*In country where motor ambulances cannot be used the transport provided under orders made by Q.M.G. will wherever possible be specially fitted out for the conveyance of sick and wounded.*"

This is a very necessary regulation, and is the outcome of our lessons in the past war. Front line medical units, mobilized on the official scale, found that when they were sent to a theatre of operations other than the western front they had to dump their transport at the base as it was practically useless for the country in which they had to operate. Special transport had to be organized, e.g., travois and litters for the hills of Macedonia; sand-carts, sand-sledges and camel convoys for the deserts of Palestine; carrier companies and light stretchers for the bush of East Africa; local craft, motor launches and river steamers for the rivers of Mesopotamia; and sledges drawn by men, ponies, reindeer or dogs for the icebound wastes of North Russia. These illustrations may impress upon you the necessity of considering the question of the evacuation of wounded in any foreign country you may be visiting either officially or for sport or pleasure.

Cavalry Field Ambulance.

Cavalry field ambulances are organized into headquarters and one company. The cavalry unit is an organization similar to the field ambulance of an infantry division, but it is smaller, more compact and built for mobility. You know far better than I do that cavalry move over extensive areas of country, and consequently, if casualties are to be cared for, medical personnel must be provided with equally fast-moving

[1] The adaptation of these for sitting cases is being considered.

transport to convey them expeditiously to the A.D.S. and to transport the wounded back over great distances. We find, therefore, that in the cavalry unit there are fewer bearers and more transport. The transport laid down is as follows :—

	Carrying capacity		
	Lying-down cases		Sitting cases
4 heavy motor ambulance cars[1] ..	16	or	32
6 light motor ambulance cars ..	12	,,	18
6 light horsed-ambulance wagons ..	12	,,	48
Total ..	40	,,	98

[1] See footnote p. 24.

During the war cavalry field ambulances were almost useless during active cavalry operations. They had not been built for speed; they could not move with their formations, and usually the greater part of the unit was left behind at the divisional dump. I will deal with the question of employing these units when we consider the method of dealing with the wounded in a purely cavalry engagement.

Prior to the war, field ambulances were composed of a headquarters and three sections, A, B and C, and cavalry field ambulances of a headquarters and two sections, A and B. Each section was divided into a bearer-subdivision and a tent-subdivision. This was a cumbersome organization and always led to confusion. It was difficult to know what to detail, and that is one reason why we have adopted the nomenclature and organization now in use.

The great point, however, is the inclusion of motor transport and wheeled stretcher carriers. The carrying of wounded is a strenuous duty, and men took time and became easily fatigued. It was found more economical in certain areas to use wheeled stretcher-carriers. In the same way horse-drawn ambulances were too slow for the rapid evacuation of wounded. At one time in France in the early days of the war every unit was crying out for motor ambulance cars, and wished to abolish horsed ambulance wagons entirely. It is, I think, a wise decision to retain a certain proportion of horsed transport, because time and again they proved their value in crossing muddy fields or finding their way along shell-pitted roads; and in 1918 when the questions of repairs to M.T. vehicles and the supply of petrol became acute, it was fortunate that there was a reserve of horsed ambulance wagons to save the situation.[2]

I have now brought you back to the limit of your responsibilities as a divisional staff officer regarding the evacuation of wounded.

Motor Ambulance Convoys.

The next unit employed in the evacuation of wounded that we wish to consider is the motor ambulance convoy. *I ask you to remember*

[2] At one time there were 352 different types of mechanical transport vehicles in France, with 281,000 different kinds of spare parts, none of which were interchangeable.

that these are not divisional units. They are controlled by the D.M.S. but may be loaned to a D.D.M.S. or A.D.M.S.

Prior to the war M.A.C.'s were suggested, but being something new they were merely the subject of criticism and talk, and ultimately failed to cross the great barrier known as "financial stringency." A compromise was effected, and we started the war with an excellent paper scheme of evacuating the wounded by returning empty supply convoys. During my research among the thousands of papers connected with the preparation of the Official Medical History of the War, I came across a report by Lord Haig on manœuvres in 1913, in which he stated that the evacuation of casualties by this method would lead to failure. He was right, and some of you may remember the cries that came from France in the early days of the war. Still, this method has its uses, as was proved in several different theatres of operations.

Motor ambulance convoys are allotted, at the present time, in the proportion of one per corps, with a reserve company at General Headquarters under the D.G. They are organized into a headquarters and three sections, each section consisting of 25 heavy cars with a carrying capacity of 100 lying-down cases. The sections are usually divided into five groups of five cars each. This organization facilitates the clearing of casualties in (1) quiet times ; (2) during raids or minor operations ; or (3) when a battle is raging. The convoys usually work a definite number of hours when road circuits are clear of other transport. At times a commanding officer, imbued with a strict military sense of formation, retains his cars until all are loaded. This is not sound, and it is advisable to send off each car immediately it is loaded.

The type of car used varies with the nature of the country in which operations are being conducted. In Italy, during the Great War, the Fiat car was most satisfactory for mountain roads, while for the rough tracks of Mesopotamia and East Africa the Ford car proved most useful.

Motor ambulance convoys are used as follows :—

(1) For evacuating casualties from M.D.S. to casualty clearing station.

(2) For clearing casualty clearing stations to ambulance train railhead.

(3) Occasionally, for clearing casualty clearing stations to hospitals on the lines of communication when the railways are blocked.

(4) Occasionally, in times of stress, for evacuating casualties from A.D.S.

Ambulance car companies (R.A.S.C.) are normally employed on the lines of communication for clearing ambulance trains arriving from the front and distributing the sick and wounded to the various hospitals, and for conveying patients invalided from hospital to quayside for embarkation.

Casualty Clearing Stations.

The casualty clearing station was another unit which in 1914 had never actually stood the test of war. It was the pivot of evacuation. It still

remains the pivot of evacuation, but it serves other equally important functions. Casualty clearing stations are provided on mobilization on the scale of one per division, and they come under the control of the D.M.S. of the Army. As already stated, they receive casualties from the M.D.S., and in addition admit the sick from units in the neighbourhood. They are generally situated at railhead, but if the distance between railhead and the fighting troops is too great, then we must stage the distance by advancing one or more casualty clearing stations. Casualty clearing stations should not be nearer to a railway junction or dump of war stores than 1,000 yards, nor should they be nearer than 500 yards to a railway or waterway used for supplies. They should, however, have their own railway sidings, if possible, especially if there is a group of casualty clearing stations in the vicinity, or they should be connected to the railway either by a special branch line or a light railway.

The functions of a casualty clearing station are fourfold :—

(1) To evacuate all cases fit to be moved.

(2) To retain cases unfit to be moved.

(3) To return light cases to duty or send them to a convalescent depot in the neighbourhood.

(4) To select operation and gas cases which require rest and quiet for as long as possible.

These units are provided with first line transport of two three-ton lorries so that during an advance they can send forward a light section to take over wounded from a M.D.S. and establish an "Advanced Operating Centre."

The complete unit is usually equipped for 200 serious and 400 light cases; the light or mobile section for 50 serious and 150 light cases. The heavy section is moved by lorry or rail. At the casualty clearing stations are a physician, dental surgeon, radiologist and a surgical team. Surgical teams were specially organized to undertake the more serious operations, and it was found that a maximum of eight could work at one time. These teams were often sent at a moment's notice to different casualty clearing stations receiving the heavy casualties of any special battle.

Organization on Lines of Communication and at Base.

I am not going to delay long in describing the organization further back, partly because I am expected to deal more with certain problems of the disposal of wounded in the advance of a division, and partly because the subject is a very big one.

Having got your casualties to the casualty clearing station, they are either treated and sent back to duty, retained as being unfit to be moved, or evacuated to the base. Evacuation to a general hospital is carried out in many ways :—

(1) Ambulance train.

(2) Improvised ambulance train.

(3) Temporary ambulance train.
(4) Barges (in France and Mesopotamia).
(5) River steamers (in Mesopotamia).
(6) Motor ambulance convoys.

The ambulance trains proper are perfectly equipped in every way for the comfort of casualties and are designed to accommodate 360 lying-down cases. The questions of equipment and accommodation are at present under review. They are organized on the scale of one per division for a small force and two per three divisions for a large force.

In times of stress improvised and temporary ambulance trains and M.A.C.s are used for the evacuation of sitting cases. On the routes to the base served by these trains rest stations are formed for the purpose of providing the wounded with necessary food and drink.

General hospitals are provided on a ten per cent basis of the total force in the field, but this is subject to variation and depends on evacuation overseas. They are modern hospitals equipped with the latest and best appliances.

If the line is long they are formed into three groups, as follows:—
(1) Advanced base area, for cases not likely to be invalided.
(2) Main base.
(3) Other areas.

Convalescent Depots.

In close association with the casualty clearing station and the general hospital are the convalescent depots for officers and men who require no further active medical treatment and although unfit are likely to become fit in a reasonable time. There are two forms of convalescent depot: (1) advanced convalescent depot; (2) base convalescent depot. The former relieves the pressure in casualty clearing stations, and the latter in base hospitals.

Convalescent depots present problems which are worth considering, and if I seem to emphasize their importance it is because they are more or less improvised units which can be made or marred by sympathetic treatment or the lack of it. Personally I am a great believer in them. By the end of the war there were in France sixteen convalescent depots with a total accommodation, including crisis expansion, for over 60,000.

No matter how mechanical the army becomes, men will always be required. The rôle of the medical service is to supply units with fit men, to keep them fit, or to make them fit in the shortest space of time. You have heard of financial millionaires before the war. During the war, for the first time in the history of our army, commanders became millionaires in men and medical officers millionaires in casualties. Just as the financier reviews his investments, let us do the same and see whither we are led.

Certain factors influence us when organizing a convalescent depot:

(1) We of the regular army are accustomed to discipline, but if you mobilize, enlist, and make use of raw recruits in battle, what happens? The ratio of admissions to hospital for neurasthenia, etc., rises. (2) We know, too, that at intervals we hear the call of pleasure and require some relaxation from boredom and temporary depression, especially when tired, run down, or recovering from a slight illness. So it is with the soldier. (3) In peace certain diseases cause the greatest number of admissions to hospital, e.g., venereal disease, combated largely by increasing the *esprit de corps* of a unit by actively interesting the officers in their men through games and social functions; diseases of the areolar tissue, i.e., slight inflammation of the skin, and skin diseases, reduced by cleanliness. Let us apply this knowledge in constructing our convalescent depots, and let us see discipline and recreation go hand in hand. Let us organize concert halls and parties, bands, athletic sports, and everything that assists us to build up again a healthy manhood and make officers and men fit, bright and keen to return to duty.

Cultivate this convalescent depot spirit in your divisions when they are not actively engaged in operations. It was carried out most successfully by one of our ablest generals in the Far East. His maxim was: "Kill or capture"; his badge a star; and his motto "Sweat and swear, but smile and get on with it." He paid great attention to every detail likely to keep his men fit and healthily occupied with work and recreation, and was not above organizing chicken and dairy farms, vegetable gardens, sports, fishing and baths. Evidently he had had his own ideas on vitamines!

Hospital Ships.

I do not propose to say much about Hospital Carriers, Ships, and Ambulance Transports. The first are passenger boats temporarily used for the evacuation of sick and wounded until the second are properly equipped for the purpose. The third convey troops and material overseas and invalids on the return journey. The first two are protected by the Geneva Convention, but the last are not, though serving a most useful purpose and economizing transport.

Methods of Dealing with Wounded in Advanced Guard Action.

You have raised several points in connexion with the employment of the medical units in a division. I ask your indulgence if I start off by raising a point I have never seen noted in a textbook. It is one of those subjects which *administrative* staff officers do not like to discuss, but it is only by an interchange of ideas during peace that we can have a settled scheme for war. We hear much about co-operation. In practically every lecture I have listened to this subject has been enlarged upon. Well, our medical arrangements depend upon the information we get from the staff. The closer the co-operation the better the results. In most medical

appreciations of the situation calculations are made as to the number of casualties expected. Now the medical service is only a part of your machinery. True, we have built up an efficient and special part of that machinery; but you are the fighting machine; you have the information; you know your plans. It is for you to tell us *what casualties to prepare for and where you expect them.* It is useless for us to have our dressing-stations on the right if you intend attacking on the left. I know you will hesitate. There is the question of secrecy. There is furthermore the effect on the *moral* of the troops if it becomes known that you expect heavy casualties. You must give us some information or prepare for a breakdown. Surely the history of Gallipoli, Mesopotamia, and East Africa will guide us in settling this question.

Man-power and wastage are important factors in battle. We are out to keep up the *moral* of the troops by increasing their confidence in the knowledge that wherever they fight, wherever they fall, they will be collected, treated and evacuated smoothly and quickly. We are out to save your men and return them to you fit and sound, in as short a time as possible.

In front-line work my maxim has always been that if it is possible for your troops to occupy any position, it is usually possible for the medical service to cater for casualties occurring in that position.

Whatever phase of operations you intend pursuing, remember before you start to have the sick and unfit weeded out and evacuated. Wherever you stop or halt, have your sick attended to and a medical unit open to receive them. Sickness causes you more wastage than any other factor. At present the daily percentage of sick may be 0·6 per cent of your force. We are working on this subject, and perhaps the following figures, comparing the battle casualties with the admissions for one disease only—viz., malaria—in Macedonia, may stamp this important fact on your memory.

	Casualties—Killed and wounded	Admissions for malaria
1916 ..	4,824 ..	32,224
1917 ..	11,072 ..	71,412
1918 ..	6,022 ..	57,775
	21,918	161,411

The sick rate among the troops is the income and super-tax an army commander pays for conducting operations in certain countries. You can make the rate high or low according to the attention paid to the prevention of disease.

With an advanced guard you will have a medical unit or unit medical officers with a regimental establishment to form a R.A.P. and to see your sick every morning. This is a regimental post, and its position will be detailed by the regimental commander in consultation with the M.O. concerned. One or two companies of a F.A. will accompany the advanced guard, but please remember that *field ambulances are not brigade units, but*

divisional units, and are detailed not by the brigade-commander, but by the A.D.M.S. The company or companies detailed *will depend upon your objective, the size of your advanced guard and the information you give.* Your object may be surprise. You may not want motor transport. This need not worry you, because motor transport can follow when the objective is attained. Suppose you come into contact with the enemy, and the troops go into action, a R.A.P. is formed. It is the duty of the regimental stretcher-bearers to clear casualties to the R.A.P. The F.A. company remains with the advanced guard commander, opens an A.D.S. after consultation with him, informs the R.A.P. of its position, and finally clears the casualties from the R.A.P. Remember two facts: *The regimental stretcher-bearers evacuate casualties to R.A.P., and the F.A. personnel from R.A.P. to A.D.S.*

The clearing of the A.D.S. is a divisional matter. Information as to its position and the number of casualties is sent back to the division or formation.

In an attack on two brigade fronts, with each regiment there is a M.O. who has certain staff and equipment. As already stated, the C.O.'s of the unit battalions arrange in conjunction with the M.O.'s the selection of the site for the R.A.P., and will give full consideration to the requirements of the R.A.P.'s in the allotment of available cover. The site of a R.A.P. is notified to all the companies. It should be near regimental headquarters, so that the M.O. can get the latest information as to the progress of the fight. It is not advisable to change the location of the R.A.P. until it can no longer function efficiently.

The A.D.M.S. after consultation with the General Staff would likely open one M.D.S. and two A.D.S.'s, one for each brigade. The position would be notified in operation orders. The A.D.S. would probably be situated near brigade headquarters, and the M.D.S. near the divisional headquarters. This would leave one field ambulance, i.e., one M.D.S. and two A.D.S.'s in reserve, ready to advance and open in any new positions. Distances between medical posts vary according to the nature of the country and the trend of battle, but roughly speaking the distance from R.A.P. to A.D.S. is two miles, from A.D.S. to M.D.S. three miles, and from M.D.S. to C.C.S. five miles.

The brigade, on receipt of operation orders, would notify their units of the positions of the A.D.S. and the M.D.S. The regimental M.O. usually, on receipt of this information, gets in touch with the A.D.S. through (1) signals or telephone, (2) runners, or (3) a personal visit. He gives the A.D.S. definite information about the position of his R.A.P.

The officer commanding the A.D.S. usually makes a tour of the front line, sizing up the possible and best routes for evacuating the wounded. He may also detail four or more bearers to each R.A.P. These bearers will bring back the first serious cases, and also information as to the number of cases in the respective R.A.P.'s. A.D.S. bearers will evacuate the R.A.P. as

opportunity offers. Wheeled stretcher carriers or other wheeled transport may be used, but naturally the latter will not be employed without permission, as the dispositions of the units may be indicated to the enemy by the movement of the wheeled transport. A motor ambulance is usually kept parked at the A.D.S., ready to take any urgent case, e.g., abdominal wound, direct to M.D.S., or advanced operating centre. The divisional motor ambulance cars clear the A.D.S. to the M.D.S.

We may consider the situation from three standpoints :—

(1) If opposition is slight and cases are few, the move forward may be continuous. Medical posts will then conform to the movement of the troops.

(2) Should there be, however, a moderate number of casualties before a move forward takes place, the A.D.M.S. might consider that the divisional arrangements, i.e., the F.A. and their transport, were sufficient for evacuating all the cases. In the event of a move forward he would order the F.A., which are open and receiving casualties, to be closed and evacuated, at the same time ordering the F.A. in reserve to proceed with the advancing troops. In a country where the local population is hostile arrangements have to be made to protect the A.D.S. and M.D.S. until they have been cleared of wounded. This was necessary in several theatres of operations during the Great War.

(3) Should, however, the casualties be very severe the advance might be held up for a certain time. Extra medical arrangements, possibly already considered, would come into the picture. These are:—

(*a*) Divisional arrangements.

(*b*) Provision of additional stretchers.

(*c*) Use of M.A.C. as already explained.

(*d*) Use of 'buses, improvised transport, as already explained.

With regard to (*a*) the Field Service Regulations state that it is the duty of the A.G.'s branch of the staff to issue orders or instructions for the collection, identification and burial of the dead, *and to search for and collect the wounded after a battle.* The arrangements made are as follows :—

(1) Provision of extra bearers to the regiment, supplied by the regiment.

(2) Organization of an improvised bearer company from a regiment not in action, usually 200 per division. Crocks are of no use; the men must be healthy and fit.

(3) Use of prisoners of war, who should not be allowed to pass backwards without carrying some stretcher cases.

(4) Organization of a Walking Wounded Collecting Post. This post is usually formed by a Corps F.A. and its position is notified to all formations. The wounded are marched back in squads, or directed singly, or conveyed in 'buses or lorries. The A.P.M. is advised to picquet the A.D.S. and W.W.C.P. and to collect and return sympathetic helpers to the firing line.

The post is organized on the lines of a rest house, i.e., food and

accommodation are provided, and it is also advisable to reserve accommodation for men who have walked but ultimately become lying-down cases. Evacuation from the W.W.C.P. is carried out by 'buses, lorries or trams, except in the case of lying-down casualties for whom special arrangements must be made.

We have at present a rough method of calculating the different varieties of casualties, and make our arrangements accordingly :—

(i) Slight—returned to duty.
(ii) Walking.
(iii) Severe—requiring lying-down accommodation.
(iv) Killed and missing.

The proportion of lying-down cases to walking wounded cases for one division from July 26 to August 11, 1916, during the Somme battles in France, was 1·22 : 1·00 ; or 54·9 per cent of the total cases admitted were lying-down cases.

The records of one field ambulance for three days during the same period show that 44·2 per cent of admissions were walking cases ; 33·9 per cent of admissions were sitting cases ; 21·7 per cent of admissions were lying-down cases.

In the first operations for the capture of Gaza in Palestine, the number of wounded was 3,022, of whom about 2,000 or 66·6 per cent were slight. The killed and missing numbered 810, or 21·1 per cent of the total casualties.

These figures are approximate, but, as a rough guide, you may take it that 25 per cent of troops are killed or missing, and of the remaining casualties approximately 40 per cent are walking cases, 35 per cent are sitting cases and 25 per cent are lying-down cases.

With regard to (*b*) in the earlier stages of all the campaigns, the evacuation of casualties was delayed owing to the want of stretchers. Stretchers accumulated at the A.D.S., as medical officers would not willingly move a seriously wounded patient from a stretcher. The officer with experience and initiative stored up stretchers, but this did not promote efficiency. The first comprehensive scheme for the supply of stretchers to units in the front line formed part of the medical arrangements for the Battle of Loos in September, 1915. Gradually it was found that 200 per division were sufficient.

A forward dump of stretchers is now organized for all engagements where heavy casualties are expected.

In Defence or Retirement.

The first duty of the regimental medical officer is to get the walking and slightly wounded cases away, as they are likely to become fit to fight again. Lying-down cases are evacuated in any possible way.

The route of the retirement must be detailed. If the rate of withdrawal is rapid, it may not be possible for field ambulances to open an A.D.S.

and M.D.S. and the main problem is to co-ordinate the movement of all wheeled transport. A central position near a main road may be selected as a point for concentrating wounded. All divisional ambulance transport will be used in front of this fixed point, where M.A.C.'s and all available transport will be stationed to take over cases and convey them direct to a C.C.S. or ambulance train. These points may have to be moved frequently and it is therefore important to keep the officer commanding the post and the M.A.C. informed. If the wounded cannot be evacuated they must be left to the care of the local inhabitants.

At Dujaila Redoubt the walking wounded were formed into platoons under officers. All transport vehicles were emptied and the stores destroyed, and every vehicle was used for carrying back the wounded. Casualties occurring in the rearguard were carried either by stretcher-bearers or on limbers.

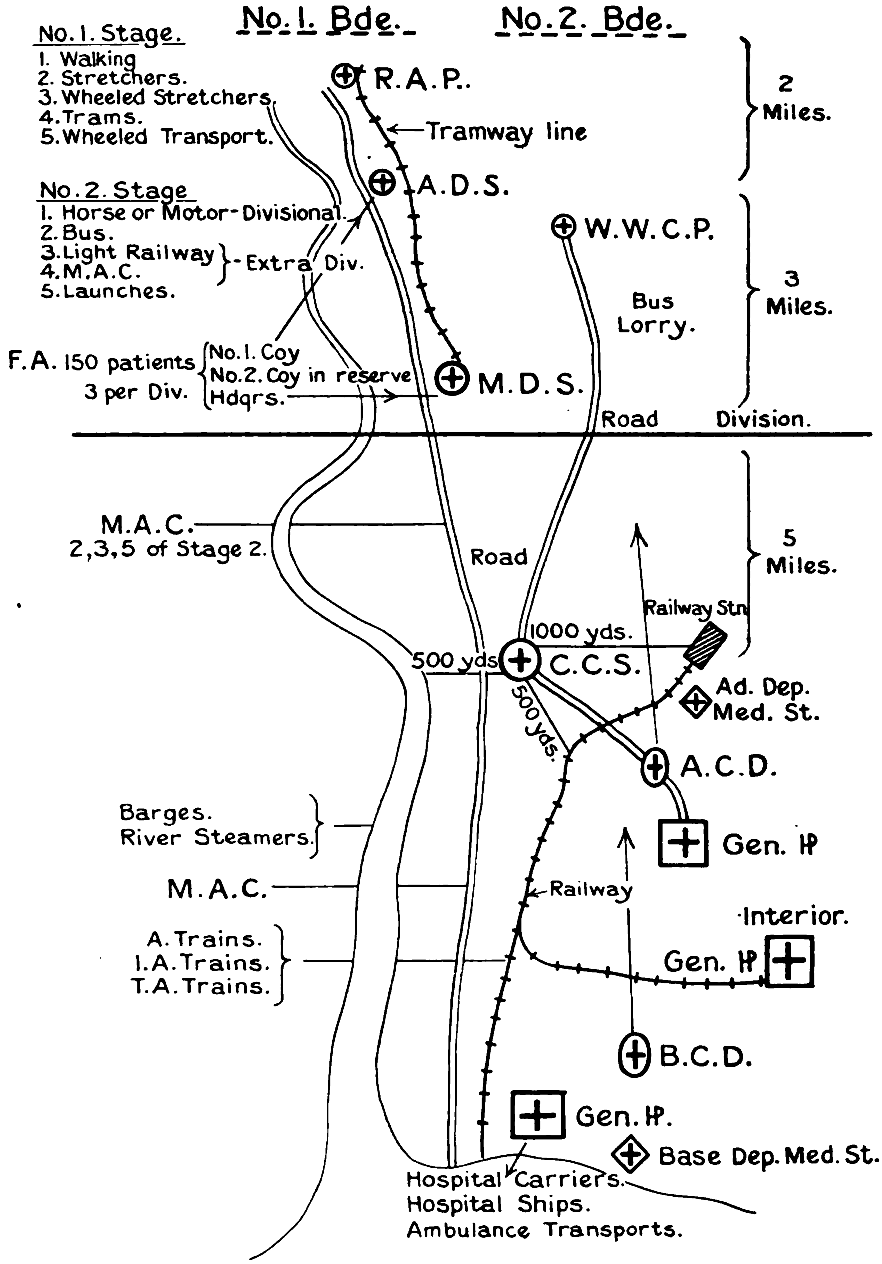
Casualties in a Purely Cavalry Engagement.

We have now come to the last problem, that of the best method of dealing with the wounded in a purely cavalry engagement. A study of the Medical History of the War does not help us to put forward any useful solution of your difficulties. I have already pointed out that the pre-war cavalry field ambulances were of little or no use except for treating sick in a stationary camp. When the cavalry moved out a very small dressing station party accompanied the force. They collected the sick and wounded and passed them by motor ambulance cars to the nearest infantry field ambulance. This frequently happened in Mesopotamia.

In Palestine the C.F.A. retained the serious cases until a C.C.S. came up and evacuated them; the slight cases were sent back in ambulance cars and lorries.

We have reorganized our cavalry field ambulance and it is now a compact mobile unit, and our possible mode of attending to casualties in a cavalry engagement would be to detail a light horsed ambulance wagon to each regiment. The regimental medical officer would then have some method of sending his cases to a collecting point on a main road where an A.D.S. could be established and the cases transferred to a motor vehicle. The O.C. field ambulance would have to keep in close touch with brigade headquarters and with the regiments.

With our rapidly advancing experience of aeroplanes, one solution of the problem does, however, present itself, and it is a fascinating theme. I mean the use of aeroplane ambulances and aeroplane troop carriers with accommodation for twenty-five sitting cases. Our present Director-General, Sir W. Leishman, is at present specially interested in this method of evacuating cases, and is following all the developments with the closest attention. We know that both types of machines are being used with success in Mesopotamia and that the French now have a regular service of ambulance planes in Morocco.


No. 1. Bde.
No. 2. Bde.
No. 1. Stage.
1. Walking
2. Stretchers.
3. Wheeled Stretchers.
4. Trams.
5. Wheeled Transport.
No. 2. Stage
1. Horse or Motor-Divisional.
2. Bus.
3. Light Railway
4. M.A.C.
- Extra Div.
5. Launches.
F.A. 150 patients
3 per Div.
No. 1. Coy
No. 2. Coy in reserve
Hdqrs.
R.A.P.
Tramway line
A.D.S.
W.W.C.P.
Bus
Lorry.
M.D.S.
Road
Division.
2
Miles.
3
Miles.
5
Miles.
M.A.C.
2,3,5 of Stage 2.
Road
Railway Stn
1000 yds.
500 yds
C.C.S.
500 yds.
Ad. Dep.
Med. St.
A.C.D.
Barges.
River Steamers.
Gen. H.
M.A.C.
Railway
Interior.
A. Trains.
I.A. Trains.
T.A. Trains.
Gen. H.
B.C.D.
Gen. H.
Base Dep. Med. St.
Hospital Carriers.
Hospital Ships.
Ambulance Transports.

A WESTERN COMMAND R.A.M.C. STAFF TOUR.

By Colonel H. ENSOR, C.B., C.M.G., D.S.O.

This Staff Tour, of which I was the Director, was held on January 9 and 10 at Shrewsbury as part of the winter training of the R.A.M.C. officers of the 42nd, 53rd and 55th Divisions of the Territorial Army.

Excluding the Director, twenty-seven officers attended, which number included four regular majors, R.A.M.C., from the Northern Command, and the Colonel on the Staff in Charge of Administration and A.Q.M.G. Western Command.

Some time previously the Director had given instruction in map reading to the R.A.M.C. officers of the above-mentioned divisions, and particular attention had been paid to the method now in use of identifying points on a map.

The Tour began at 6.30 p.m. January 9, when, all the officers having assembled in the Conference Room, the corrected appreciations were given out to the officers who had sent them in. The Director then read out the appreciation he had written, which is given below, and gave his views as to how medical appreciations should be written.

The officers were then formed into syndicates, and at 9 p.m. the same evening they again assembled, and a series of "tasks" were given to them, which, with the exception of Task No. 5, were based on the Narratives given out.

Each syndicate having written out its solution of the task set, handed it in for correction, and when all had been handed in, the Director stated what in his opinion was the correct solution.

The work done on the following day, January 10, is described later.

The units given in the order of battle as mobilized for each corps of the Westland Army have been taken from the papers of the 1925 Western Command Staff Tour. It will be observed that a field ambulance is given as one of the medical units of each corps. Unfortunately time did not permit of any discussion as to what the rôle of this field ambulance would be in battle.

The tasks set and the solutions made by the Director are given below, as is also a résumé of the discussion which took place as to what dispositions the officers commanding field ambulances of the 1st Division, Westland Army, should make for the attack on the enemy position on January 10. At the close of this discussion the Director read out the R.A.M.C. Order for this attack, which he had written, and the Tour was at an end.

The work handed in by syndicates was corrected and returned a few

days later to the headquarters of the field ambulances of the 42nd, 53rd and 55th Divisions for the information of the officers concerned.

My best thanks are due to my Chief Clerk, Qrmr. Serjt. P. J. Martin, R.A.M.C., and Cpl. A. G. Turner, R.A.M.C., for the very large amount of work they carried out in typing and duplicating all the papers used in this Tour.

WESTERN COMMAND R.A.M.C. STAFF TOUR, 1926.

Reference O.S. Maps 5, 1 inch, Sheets 60 and 70.

Preliminary Instructions.

An appreciation of the medical situation from the point of view of D.M.S., Westland Army, is to be written by you and forwarded to D.D.M.S., Western Command, Chester, under confidential cover, by December 20, 1925. This appreciation is to be written on the supposition that the D.M.S., Westland Army, has been directed to forward one to the Westland Army Headquarters on mobilization being ordered on December 9, the date on which hostilities commenced between the Northland and Southland Armies. It is to be understood that armed intervention on the part of Westland in aid of Southland is imminent.

Line of communication medical units are to be considered as about to be mobilized on the scale given in R.A.M.C. training, except that in the place of the two stationary hospitals, two general hospitals, each of 600 beds, will be mobilized for each division of the Westland Army, and, also, two general hospitals, each of 1,200 beds, in place of the two general hospitals mentioned in R.A.M.C. training.

It may also be taken for granted that a convalescent depot (2,000 men) will be mobilized, if considered necessary, for each corps of the Westland Army.

The question of transport of sick and wounded by hospital ships does not apply to this scheme, and the requirements of the two defence divisions of the Westland Army are not to be considered.

It is to be understood that all sick and wounded of Westland Army are to be evacuated to selected places in Westland. The appreciation should be short and concise. Nothing should be mentioned in it except such matters as the Westland Army Command will wish to know concerning the medical problem. The character of the country in which operations are expected to take place, and its resources, roads and railway communications are, for instance, already known to Army Headquarters, and need not be mentioned. The hospital requirements for sick and wounded of the Westland Divisions and corps troops are to be carefully estimated, the information given on these points in R.A.M.C. training being taken as a guide.

General Idea.

(1) Northland (capital York) and Southland (capital London), two powerful countries, are at war, hostilities having commenced on December, 9, 1925.

The southern boundaries of the counties of Lancashire and Yorkshire represent the frontier between these two countries. Westland (Wales and Monmouthshire, capital Swansea), mobilized her army when hostilities commenced between Northland and Southland, ostensibly with the object of maintaining her neutrality.

(2) The initial fighting between Northland and Southland has gone much in favour of Northland, whose troops advanced into Southland across the Lancashire—Cheshire frontier and, by January 5, had succeeded in forcing the Southland forces to retire on Whitchurch—Stoke-on-Trent. The withdrawal of the Southland forces was an orderly one and nothing approaching a decision has been obtained by Northland.

(3) The Northland Army consists of six corps, each of two divisions, and a cavalry division. Of these forces, three corps are on the Yorkshire frontier, and two corps, and the cavalry division, engaged in the advance into Southland over the Lancashire—Cheshire frontier. The remaining corps is in reserve in the Chester—Tarporley areas.

Southland's Army is made up of five corps, each of two divisions, and a cavalry division. Of these forces, two corps and the cavalry division (less one brigade) are opposed to the three Northland Corps on the frontier of Yorkshire; two corps, a division, and a cavalry brigade are holding the line Whitchurch—Stoke-on-Trent. The remaining corps (less one division) is in reserve about Lichfield. Westland's Army consists of two corps, each of two divisions, and of two defence divisions. which are poorly equipped as regards artillery and transport. Westland is weak in cavalry, only possessing two cavalry regiments whose rôle is that of corps cavalry.

(4) On January 3, 1926, Westland declared war on Northland, in alliance with Southland, and on that date her Army was disposed as follows:—

Army Headquarters	Cardiff.
1st Corps.	
Headquarters	Builth.
1st and 2nd Divisions ...	Radnorshire.
2nd Corps.	
Headquarters	Newport.
3rd and 4th Divisions ...	Monmouthshire.
Defence Divisions.	
1st Defence Division ...	Denbighshire and Flintshire.
2nd Defence Division ...	Montgomeryshire.

(5) It was decided as a result of a conference between the Southland and Westland commands to employ the 2nd Westland Corps in support of the left of the Southland Army, and the 1st Corps in an attempt to envelop the right flank of the Northland forces.

(6) The forces of Northland, Southland and Westland, with the exception of the two Defence Divisions of Westland, are to be considered as organized and equipped in accordance with British War Establishments, Small Wars, Parts XXIIIA, XXIVA, XXVA, and XXVIA, so far as lines of communication and base medical units are concerned.

The sole object of the tour is to consider the medical arrangements of an army on active service, and in consequence the scheme has been arranged with that object, and no other.

The order of battle of the Westland Army, which is the Army whose medical arrangements will be considered, is attached, the composition of the 1st Division is also given in detail.

The medical arrangements for the two Defence Divisions of Westland's Army will not be considered. It is to be imagined that they will be provided by the voluntary aid detachments of the counties in which they are operating. The medical arrangements for the Air Force of Westland's Army will, also, not be considered.

Special Idea.

Reference O.S. Map, Sheet 70.

At noon, on January 7, the situation of the Westland Army was as follows:—

1st Corps.
  Headquarters, Knighton (sq. C. 33).

1st Division.
  Ludlow (E. 65)—Bromfield (E. 38)—Onibury (Z. 00) areas. Divisional Headquarters, Ludlow. Medical Railhead, Knighton.

2nd Division and 1st Corps Cavalry Regiment.
  Clun (K. 52)—Bishop's Castle (S. 70) areas. Divisional Headquarters, Clun. Medical Railhead, Knighton.

2nd Corps.
  Entraining for Wolverhampton—Dudley areas.

The 2nd Defence Division has crossed the Westland—Southland frontier and is in occupation of the high ground east of Welshpool (Long Mountain and Breidden Hill (O.S. Map, Sheet 60).

Order of Battle.—Westland Army.

Army Headquarters.

1st Corps.—1st Division. 2nd Division. Corps Troops.
2nd Corps.—3rd Division. 4th Division. Corps Troops.

1*st* CORPS HEADQUARTERS.

Corps Cavalry.—1st Cavalry Regiment.

Corps Artillery.—Headquarters Corps Medium Artillery. Two Field Artillery Brigades. Two Field Artillery Brigades Ammunition Columns. Two Medium Artillery Brigades. One Anti-Aircraft Artillery Brigade. One R.A. Survey Company.

Engineers.—Two Army Troops Companies. One Field Survey Company. One Electrical Mechanical Company. One Anti-Aircraft Searchlight Battalion. One Anti-Gas Laboratory and Demonstration Unit. One Workshop and Park R.E. One Light Bridging Park R.E.

Signals for R.A.F.—One Wing H.Q. Signal Section. Six Squadrons Signal Sections. One Balloon Signal Section. One Aircraft Park Signal Section.

Signals.—One Corps Signals. Two Field Brigade R.A. Signal Sections. Two Medium Brigade R.A. Signal Sections. One A.A. Signal Section.

Tanks.—Two Battalions Royal Tank Corps. One Tank Salvage Company.

Supply and Transport.—Two Divisional Mechanical Transport Companies. One Corps Troops M.T. Company. One Med. Artillery M.T. Company. One Reserve M.T. Company. One Advanced M.T. Vehicle Reception Depot. One Auxiliary H. T. Company. Two Railhead Supply Detachments.

Medical.—One Field Ambulance. One Sanitary Section. Two Casualty Clearing Stations. One Advanced Depot of Medical Stores. One Motor Ambulance Convoy. One Mobile Hygienic Laboratory. One Mobile Bacteriological Laboratory.

Ordnance.—Two Ordnance Mobile Workshops (Light). One Ordnance Mobile Workshop (Medium). One Ammunition Company. One General Stores Company. One Anti-Gas Mask Repair Shop.

Veterinary.—One Veterinary Evacuating Station. One Advanced Depot Veterinary Stores.

Provost.—Two Provost Companies.

2*nd* CORPS.

As for 1st Corps.

1*st Division.*

1st Divisional Headquarters.

1st Infantry Brigade.—Brigade Headquarters. "A" Battalion. "B" Battalion. "C" Battalion. "D" Battalion.

2nd Infantry Brigade.—Brigade Headquarters. "E" Battalion. "F" Battalion. "G" Battalion. "H" Battalion.

3rd Infantry Brigade.—Brigade Headquarters. "K" Battalion. "L" Battalion. "M" Battalion. "N" Battalion.

Headquarters 1st Division Artillery.—10th, 11th and 12th Field Artillery Brigades. 1st Pack Brigade. 1st Divisional Ammunition Column.

Headquarters 1st Division R.E.—10th, 11th and 12th Field Companies R.E. 10th Field Park Company R.E.

1st Divisional Signals.

1st Divisional Train.

7th, 8th, 142nd Field Ambulances.

1st Divisional Sanitary Section.

1st Mobile Veterinary Section.

1st Provost Company.

NARRATIVE No. 1.

Reference O.S. Map, 1 inch, Sheet 70.

Information was received at Headquarters 1st Corps, at 10.00 hours January 7, that the enemy at daybreak, on January 6, attacked the left of Southland forces about Whitchurch, employing important fresh forces. The result has been that the left of Southland's forces, to avoid envelopment, retired in the night in the direction of Market Drayton, thus uncovering Shrewsbury.

Definite information has also been received that the enemy have occupied Wrexham and Ellesmere, our defence forces being quite unable to oppose them effectually.

There is an unconfirmed report that enemy cavalry occupied Wem this morning.

Air reconnaissances report that a large column of the enemy is advancing in the direction of Shrewsbury from Ellesmere. This column is estimated to consist of a brigade of infantry, with artillery.

Orders were issued from 1st Corps Headquarters, at noon, January 7, to the effect that the 1st Division was to march at daybreak, January 8, on Shrewsbury and the 2nd Division and 1st Corps Cavalry Regiment at the same hour on Welshpool (M. 88) via Church Stoke (S. 25).

The 1st Division is to march on Shrewsbury in two columns.

One column composed of the 1st Infantry Brigade, 10th Field Artillery Brigade, 10th Field Company, R.E., is to make use of the road to Shrewsbury via Craven Arms (Y. 83)—Horderley (Y. 68)—Wentnor (T. 34).

The second column consisting of Divisional Headquarters and the remaining troops of the 1st Division is to march via Craven Arms and Church Stretton (U. 04) on Shrewsbury, the 2nd Infantry Brigade being the leading Infantry Brigade.

DISPOSITION OF 1ST DIVISION UNITS AT NOON, JANUARY 7.
Reference O.S. Map, 1 inch, Sheet 70.

1st Division Headquarters	Ludlow area (E. 65).
3rd Infantry Brigade	
12th Field Artillery Brigade	
12th Field Company R.E.	
10th Field Park R.E.	
7th Field Ambulance	
8th Field Ambulance	
142nd Field Ambulance	
1st Divisional Sanitary Section	
1st Mobile Veterinary Section	
1st Provost Company	
2nd Infantry Brigade	Bromfield—Stanton Lacy areas (E. 38 and E. 59).
11th Field Artillery Brigade	
1st Pack Artillery Brigade	
11th Field Company R.E.	
1st Infantry Brigade	Onibury — Clungunford areas (Z. 00 and D. 59).
10th Field Artillery Brigade	
10th Field Company R.E.	
1st Divisional Ammunition Column ...	Leintwardine (D. 55).
1st Divisional Train	Brampton Bryan (D. 23)

DISPOSITION OF 1ST CORPS MEDICAL UNITS AT NOON, JANUARY 7.
Reference O.S. Map, 1 inch, Sheet 70.

1st Corps Field Ambulance, less "A" Company	Builth.
"A" Company 1st Corps Field Ambulance	Knighton.
No. 2 Casualty Clearing Station (open)	
No. 1 Casualty Clearing Station (closed)	
1st Corps Sanitary Section	Builth.
No. 1 Motor Ambulance Convoy	Knighton.
No. 1 Advanced Depot of Medical Stores...	

NARRATIVE NO 2.
Reference O.S. Map, 1 inch, Sheet 70.

(1) The 1st Division marched at daybreak, January 8, in two columns and by 16.00 hours, January 8, had halted for the night in the following areas:—

Right Column. Little Stretton (T. 92)—Marshbrook (T. 90)—Felhampton (Y. 98)—Wistanstow (Y. 86) areas.
1st Divisional Headquarters, Felhampton Court (Y. 9986).

2nd Infantry Brigade Headquarters, Manor House (T. 9518).

No. 8. Field Ambulance, Mill at T. 9615.

3rd Infantry Brigade Headquarters, Inn at Upper Affcot (Y. 9876).

No. 142, Field Ambulance, Hall at Strefford (Y. 9868).

Left Column. Norbury (T. 14)—Wentnor (T. 34) areas.

1st Infantry Brigade Headquarters, Wentnor Rectory (T. 3838).

No. 7 Field Ambulance, School at T. 2435.

Owing to the sparsely populated district it was found impossible to billet all the troops; many units of the right column were obliged to bivouac. The weather was dry and cold, but foggy.

(2) Information was received at 1st Division Headquarters, at 23.00 hours, January 8, that enemy cavalry occupied Shrewsbury at 16.00 hours, January 8, without opposition. The bridges in and near Shrewsbury have not been destroyed and are now held by the enemy.

Air reconnaissances were attempted during the day but, owing to fog, no information of value could be obtained.

(3) The A.D.M.S., 1st Division, was informed on the evening of January 8 by D.D.M.S., 1st Corps, that No. 1 Casualty Clearing Station would move by rail from Knighton on the morning of January 9 and would open for the reception of sick and wounded at Horderly (Y. 68) at 18.00 hours the same day.

No. 2 Casualty Clearing Station will close at Knighton at 18.00 hours, January 9, and proceed by road to Welshpool under arrangements made by the "Q" branch of Westland Army.

No. 1 M.A.C. is also to move to Horderley on January 9 as also is "A" Company 1st Corps Field Ambulance.

It will be seen from the above that the Medical Railhead of the 1st Division will, on January 9, move from Knighton to Horderley.

D.M.S., Westland Army, as a result of representations made to him by D.D.M.S. 1st Corps, has ordered one section of his reserve motor ambulance convoy to report to him for duty. This section on arrival will be sent to Welshpool.

Narrative No. 3.

Reference O.S. Maps, 1 inch, Sheets 60 *and* 70.

The march of the 1st Division was resumed at 09.00 hours, January 9, an earlier start being impossible owing to dense fog, which lifted but little throughout the day. Much delay later was also caused by enemy cavalry, estimated at a squadron, being met with in occupation of the villages of Longnor and Micklewood (squares P. 41 and P. 32, sheet 60),

the advanced guard being forced to deploy to deal with them. The enemy cavalry retired as soon as the deployment of the advanced guard was completed. Our casualties were two killed and eight wounded.

By 17.00 hours, January 9, the 1st Division halted for the night and the troops were disposed as follows:—

Right Column. Dorrington (P. 34)—Great and Little Ryton (P. 44)—Frodesley (P. 72)—Longnor (P. 41)—Leebotwood (U. 39)—All Stretton (U. 16)—Church Stretton (U. 04) areas.

Divisional Headquarters, Dudgeley House (U. 27).

Headquarters, 2nd Infantry Brigade, Longnor.

"E" Infantry Battalion, Dorrington.

"F" ,, ,, Great and Little Ryton.

"G" ,, ,, Frodesley.

"H" ,, ,, Netley area (P. 23).

No. 8 Field Ambulance, Leebotwood.

Headquarters, 3rd Infantry Brigade, All Stretton.

No. 142 Field Ambulance, Church Stretton.

Left Column. Church Pulverbatch (O. 84)—Castle Pulverbatch (O. 73)—Cothercott (O. 72) areas.

Headquarters, 1st Infantry Brigade, Inn at Castle Pulverbatch.

No. 7 Field Ambulance, Cothercott.

The 1st Corps Cavalry Regiment advanced from Welshpool towards Shrewsbury early this morning (January 9), and reported that at 14.00 hours to-day it was in action with superior forces of enemy cavalry west of Yockleton (J. 51). It has taken up billets for the night as follows:—

Headquarters and two squadrons, Westbury (J. 10).

One squadron (less one troop), at Minsterley (O. 36).

One troop, Habberley (O. 54).

Aerial reconnaissance was impossible all day owing to the fog.

The information gathered from refugees is that enemy forces, said to consist of cavalry and artillery, hold Plealey (O. 88)—Longden (O. 97)—Exfordsgreen (P. 17)—Condover (P. 56). It is known, however, that enemy infantry were on the march on Shrewsbury from Ellesmere on January 8, and they have probably arrived at Shrewsbury to-day.

Narrative No. 4.

During the night, January 9th to 10th, the fog cleared and patrols of the right column reported much movement in Condover village and also the sound of transport on the roads to the north of it. Several encounters with enemy patrols occurred in Condover Park, but no prisoners were taken.

Stapleton (P. 25) was found to be unoccupied by the enemy as also the high ground to the east of it, which was occupied by a company of "E" Battalion, 2nd Infantry Brigade, about 19.00 hours, January 9. The left column reported that their patrols were fired on from the direction of Longden Manor (O. 86).

It is certain from information obtained that the enemy is holding the following line:—

Longden Manor—Longden—Exfordsgreen—Condover.

It is also certain that the enemy has been re-inforced by infantry estimated at a brigade.

Orders were issued by 1st Division Headquarters that the enemy was to be attacked to-morrow, January 10. The 1st Infantry Brigade is ordered to attack the enemy line Longden Manor—Exfordsgreen (exclusive); the 2nd Infantry Brigade to attack the line Exfordsgreen—Condover. The Colonel Commandant, 3rd Infantry Brigade, also received orders to send two battalions to Frodesley in readiness to advance to-morrow, January 10, to outflank the enemy's position at Condover from the east.

It is of the greatest importance that Shrewsbury should be occupied by Westland's forces as soon as possible, as any delay in doing so will give Northland time to reinforce the troops that are in possession of it. On this account the attack on January 10 is to be delivered with the utmost resolution.

Narrative No. 5.

On receipt of the orders from 1st Division Headquarters, mentioned in Narrative No. 4, Colonel Commandant, 1st Infantry Brigade, issued orders for the attack on January 10 to the following effect:—

"A" Battalion, supported by "B" Battalion, to capture Longden Manor and park, and later to occupy Plealey.

"C" Battalion to advance east of the main road to Shrewsbury to demonstrate against Longden and Exfordsgreen.

"D" Battalion to remain in brigade reserve north of Castle Pulverbatch.

The advance is ordered to begin at 07.00 hours January 10.

The orders issued by Headquarters, 2nd Infantry Brigade, were as follows:—

"E" Battalion, less one Company in occupation of high ground to east of Stapleton, to demonstrate in the direction of Exfordsgreen.

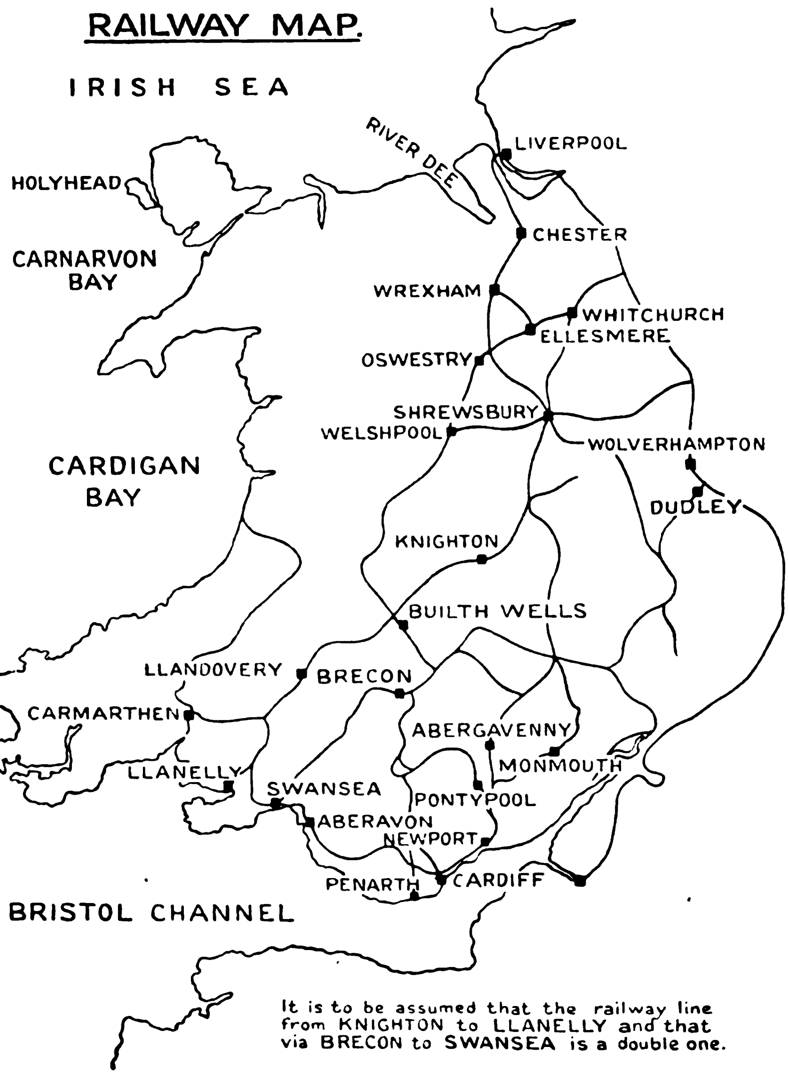
"F" Battalion, supported by "G" Battalion, to attack Condover.

"H" Battalion to move into brigade reserve north of Longnor.

The advance of the battalions to begin at 07.00 hours January 10.

The two battalions of the 3rd Infantry Brigade ordered to proceed to

Frodesley, received orders to march off to this place at 04.00 hours, January 10, and to advance to outflank the enemy position at Condover at 06.00 hours.



Information was received at 1st Division Headquarters that the 2nd Division, 1st Corps, is advancing on Shrewsbury from Welshpool, and is expected to engage the enemy troops covering Shrewsbury from the west about middav, January 10. This information has been transmitted to the troops.

APPRECIATION OF THE MEDICAL PROBLEM FROM THE POINT OF VIEW OF D.M.S., WESTLAND ARMY.

The Westland Army, exclusive of lines of communication units, is composed of four infantry divisions and of corps troops.

The officers and other ranks of the four divisions total 2,764 officers and 66,776 other ranks. The corps troops of the two corps amount to 1,246 officers and 27,130 other ranks. The sum of these figures gives a total of 4,010 officers and 93,906 other ranks, i.e., medical arrangements will be required for the sick and wounded of 97,916 officers and other ranks which number, as stated above, does not include the personnel of such lines of communication units as may be mobilized.

For the sake of convenience in calculation, this number 97,916 will be taken as 100,000 in estimating the probable admissions to hospital of the sick and casual wounded.

The campaign which is imminent will be one of rapid movement, at any rate in its early stages, and the fighting will be that incidental to open warfare. The time of the year is mid-winter, and the weather may be confidently expected to increase the normal number of sick, particularly the cases of respiratory diseases. The bombing of troops on the line of march by hostile aircraft, even when contact with the enemy is not to be expected, may, with certainty, be considered as a fertile source of casualties. For these reasons it may be taken as a fact that the usual estimate of the numbers of sick and casual wounded, which will daily require hospital treatment, will be very largely exceeded.

This usual estimate is that out of every 1,000 men, three men will daily require treatment in hospital. It is estimated that it will be necessary to increase this number (3 per 1,000), for the reasons given above, and my calculations are based on the assumption that five men out of every 1,000 will daily require hospital treatment.

This means that 500 men daily will be admitted to hospital from the 100,000 men forming the divisional units and corps troops of the Westland Army.

The Army is well protected against smallpox and it is now some years since any cases of typhus fever have been recorded from our population. The time of the year is against the prevalence of fly-borne diseases, and, so long as the orders with regard to the chlorination of drinking water are complied with, water-borne diseases will be negligible.

It has been stated above that 500 men daily may be expected to be admitted to hospital from the 100,000 men forming the divisional units and corps troops of the Westland Army. If it be assumed that 40 per cent of men admitted to hospital are discharged fit for duty in seven days, and that 50 per cent require twenty-one days' treatment, and that 10 per cent may have to be treated in hospital for an indefinite period, it will

mean that by the end of the twenty-second day there will be 7,300 men in hospital, which number is likely to increase by about fifty daily. (See Appendix to this Appreciation.)

It is to be understood that this number, 7,300 in hospital by the end of the twenty-second day after operations commence, is caused by the daily admissions of sick and casual wounded from the divisions and corps troops alone; it is not the result of the troops being engaged in battle.

The battle casualties to be expected can be estimated as ten per cent of three-fifths of the number of troops engaged, so far as divisional units are concerned, and ten per cent of one-fifth of the total number of corps troops.

In the case of both divisional and corps units, twenty per cent of the casualties may be considered as killed, or missing, and will require no medical arrangements. In the event, therefore, of the whole of the Westland Army being engaged, it can be estimated that the casualties from divisional units will be the following:—

Ten per cent of three-fifths of 69,540 (41,724) = 4,172 casualties, less 834 killed, or missing, = 3,338 wounded from divisional units requiring hospital treatment.

Those from corps troops will be:—

Ten per cent of one-fifth of 28,376 (5,675) = 567 casualties, less 113 killed, or missing, = 454 wounded from the corps troops.

These two numbers—3,338 and 454—together make a total of 3,792, which may be taken as the number of wounded to be accommodated after the first general action with the enemy has occurred. In the estimation of the battle casualties given above, no account has been taken of the possibility of the enemy making use of poisonous gases. Their use, as is well known, is now forbidden by the League of Nations, but that most certainly does not make their use impossible—far from it.

In the event of gas being used our battle casualties may possibly be much more severe. The time of the year is, however, not favourable to the use of mustard gas—the gas most to be feared.

It will be seen from the above that, supposing a general action in which all our divisional units and corps troops are engaged should occur on any day after the twenty-second day from the commencement of hostilities, hospital accommodation for at least 11,000 officers and men will be required, a large number, which will be materially increased if gas is used by the enemy. Also more than one general action may be expected to occur in the course of the war. The campaign will, in its early stages at least, be one of rapid movement, and in consequence no sick and wounded requiring more treatment than "medicine and duty" should be retained with units. The field ambulances and casualty clearing stations must, also, not retain men who are not fit for full duty a single hour more

than is absolutely necessary. The lines of communication will not be long, and no difficulty should occur in returning men, discharged as fit for duty, from the hospitals to their units.

It is understood that regimental medical establishments, field ambulances and sanitary sections will be mobilized for the service of the divisions in accordance with the existing war establishments, and that the same applies with regard to the regimental medical establishments of such units of corps troops as are in possession of them.

The question of the number of non-divisional and lines of communication medical units to be mobilized will now be briefly considered.

It is recommended that each corps should include as part of its corps troops the following non-divisional medical units:—

One Field Ambulance.
One Sanitary Section.
Two Casualty Clearing Stations.
One Motor Ambulance Convoy.
One Advanced Depot of Medical Stores.
One Mobile Bacteriological Laboratory.
One Mobile Hygiene Laboratory.

With regard to lines of communication medical units, the provision of the following is strongly recommended as a minimnm which will almost certainly require to be augmented in the event of the war being prolonged beyond three months.

General Hospitals (1,200 beds)	8
General Hospitals (600 beds)	8
Hospital for Venereal Diseases (400 beds)	1
Convalescent Depots (2,000 men each)	2
Base Depot of Medical Stores	2
Sanitary Sections	3
Ambulance Trains	4

In addition, the mobilization of one auxiliary motor ambulance convoy will be necessary for the service of these lines of communication medical units.

These units, if mobilized, will furnish a total of 14,800 hospital beds, of which number 1,440 will be beds for officers.

The mobilization of two convalescent depots (one for each corps) is absolutely necessary for the relief of congestion in the hospitals, and as places where men who have been some time under treatment may be hardened before being again sent for duty with their units. Without these units the hospitals will not be in a position, after the first six weeks of the campaign, to receive the large numbers of wounded to be expected after a general action.

It will be observed that no provision has been made for the treatment of ladies of the nursing services when on the sick list. It is proposed to send such cases as paying patients to the nearest civil hospitals that take in such patients.

It may be objected that my estimate of the hospital accommodation required is excessive, but it must be remembered that no evacuation of sick and wounded out of the country will be possible, and, also, that sick from such lines of communication units as it may be decided later to mobilize will have to be accommodated in the above-mentioned lines of communication medical units, not to mention wounded and sick prisoners of war.

No help need be anticipated from the existing civil hospitals in West-land. Such hospitals will, in all probability, be very short of accommodation for civilian patients, especially in the large towns, as a result of hostile air raids. It is hoped that some extra hospital beds will be provided by the voluntary aid detachments, but the number will at first be quite small, and it is not my intention to allow any cases, except such as are not likely to be fit for service under six months, to be transferred to such hospitals.

It is recommended that the eight general hospitals (each of 1,200 beds) and the venereal hospital should be opened as soon as they have been mobilized, and situated as follows:—

Nos. 1, 2, 3 and 4 General Hospitals ...	Cardiff Area
Nos. 5 and 6 General Hospitals ...	Newport area
Nos. 7 and 8 General Hospitals ...	Swansea area
Venereal Diseases Hospital	Aberavon

With regard to the general hospitals (each of 600 beds) it is proposed, in view of the fact that 1st and 2nd Corps will concentrate in Radnorshire and Monmouthshire, to open four of these at the places given below:—

No. 9 General Hospital	Abergavenny
No. 10 General Hospital	Pontypool
No. 11 General Hospital	Builth
No. 12 General Hospital	Llandovery

The remaining four general hospitals should remain in reserve, after they have been mobilized, ready to open where required.

It is important that the convalescent depots should be opened for the reception of cases as soon as possible, as the return of sick and wounded rapidly to their units, after they have been cured of their disabilities, will depend very largely on the efficiency of these units. One convalescent depot should be opened at Penarth and the other at Carmarthen.

The general hospitals should, in consideration of the time of the year, be accommodated in buildings wherever possible, but it is recognized that this may not be possible in all cases, and that some of them will be obliged to make use of tents.

With regard to the remaining lines of communication medical units:—

One sanitary section lines of communication should be located in each of the following areas:—

Newport.
Cardiff.
Swansea.

One base depot of medical stores should be opened at Cardiff and the other at Swansea.

The following summary gives the medical units, with the numbers of officers and other ranks, which will be required for their service. The figures given include *attached* non-medical personnel of the transport and dental services and of the convalescent depots, but not those of the Chaplains' Department.

Units	No.	Officers	Other ranks
DIVISIONAL MEDICAL UNITS.			
Field Ambulances	12	132	2,532
Sanitary Sections	4	4	112
NON-DIVISIONAL MEDICAL UNITS.			
Field Ambulances	2	22	424
Sanitary Sections	2	2	46
Casualty Clearing Stations	4	32	328
[1] Motor Ambulance Convoys.. ..	3	12	534
Advanced Depots of Medical Stores ..	2	2	16
Mobile Hygiene Laboratories ..	2	4	10
Mobile Bacteriological Laboratories..	2	4	10
LINES OF COMMUNICATION MEDICAL UNITS.			
General Hospitals (1,200 beds) ..	8	256	1,760
General Hospitals (600 beds) ..	8	160	1,088
Venereal Diseases Hospitals (400 beds)	1	5	25
Sanitary Sections	3	3	84
Convalescent Depots	2	20	188
Base Depots of Medical Stores ..	2	4	40
Ambulance Trains..	4	12	180
Total ..	62	674	7,377

[1] One M.A.C. as a reserve under D.M.S., Westland Army.

The regimental medical officers who will be required for duty with regimental medical establishments of the divisions and corps troops are the following:—

Regimental medical establishments of divisional units	.. ..	76
,, ,, ,, ,, corps troops	.. ..	18
	Total ..	94

The following numbers of ladies of the nursing services will be required for duty with lines of communication medical units:—

With General Hospitals	.. .. ..	1,040
With Ambulance Trains	.. .. ..	12
	Total ..	1,052

Medical Equipment, etc.

The medical equipment of all medical units and regimental medical establishments of the Army is up to scale and sufficient stocks are held in the medical stores.

The existing supply of antitetanic serum is, however, not likely to meet requirements for more than the first two months of war, and arrangements have been made to obtain further supplies from abroad. It must be remembered that, as the fighting will occur for the most part over highly-manured country, every wounded man must be given a prophylactic dose of antitetanic serum.

Ordnance Equipment.

The hospital clothing provided for field ambulances, casualty clearing stations and general hospitals is on the scale given in the Army Form G. 1098 for these units, and is not sufficient so far as the field ambulances and casualty clearing stations are concerned. Each field ambulance has only 150 suits of pyjamas and each casualty clearing station 300 suits.

If mustard gas be made use of by the enemy, it will be absolutely necessary for each case suffering from its effects to be completely undressed, washed in soap and water and clothed in clean pyjamas before he can be evacuated to the lines of communication. This should be done in the main dressing station of divisions, whenever possible; if not done there, it must be carried out in the casualty clearing stations. In consequence the number of pyjamas provided for these above-mentioned units, while ample for the use of ordinary casualties, will not suffice if mustard gas be used by the enemy.

It is very strongly recommended that Ordnance be asked to provide pyjamas for these units on the following scale:—

Field Ambulances ...	500
Casualty Clearing Stations	2,000

Experience in former wars has proved that each corps must be in possession of an ample reserve of stretchers. The numbers provided for the field ambulances, given on Army Form G. 1098 are hopelessly inadequate when casualties on a large scale have to be dealt with. Each corps should have a reserve of, at least, 500 stretchers, and this number will have to be very largely increased if the fighting later becomes that known as position warfare.

Laundries, Delousing Centres.

The provision of these is now the duty of the "Q" branch of the staff. It is hoped that they will be on an adequate scale, as on them the continued good health of the troops very largely depends.

APPENDIX.

Table showing how the number 7,300 in hospital by the end of the twenty-second day after operations commence, is arrived at.

The calculations of Colonel R. S. Hannay, C.M.G., D.S.O., have been used (JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, March, 1924).

Day	Admissions	Discharges	Remaining
1	500	Nil	500
2	500	Nil	1,000
3	500	Nil	1,500
4	500	Nil	2,000
5	5C0	Nil	2,500
6	500	Nil	3,000
7	500	200	3,300
8	500	200	3,600
9	500	200	3,900
10	500	200	4,200
11	500	200	4,500
12	500	200	4,800
13	500	200	5,100
14	500	200	5,400
15	500	200	5,700
16	500	200	6,000
17	500	200	6,300
18	500	200	6,600
19	500	200	6,900
20	500	200	7,200
21	500	450	7,250
22	500	450	7,300

(To be continued.)

THE ARMY CLASS AT THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE.

By Lieutenant-Colonel P. G. EASTON, C.B.E., D.S.O.
Royal Army Medical Corps.

As it has been my good fortune to have just completed a course at the London School of Economics, it has been suggested that a short account of the course may be of interest to officers who contemplate applying for vacancies in future classes.

The institution of the Army class was part of the plan of Army reorganization introduced by Lord Haldane when Secretary of State for War in 1906. His idea was that Army officers would in this way be brought into close touch with problems of civil administration and organization and with the methods advocated to deal with them. Lord Haldane considered that, by being thus given a broader outlook on affairs in general, officers would be in a better position to work out the various problems of Army administration with which they might be confronted. No vacancies were allotted to the Royal Army Medical Corps in the original Army classes, but when, after the Great War, the School of Army Administration at Chisledon took the place of the Army class at the London School of Economics, Sir John Goodwin was able to secure the allotment of two places for officers of his Corps. The School of Army Administration was abolished under the economy axe and the Army class at the London School of Economics was reinstituted in 1924, when the Corps retained its two places in the allotment.

The Army class is composed of thirty officers, including one or two officers of the R.A.F. An Army order is issued in August calling for the names of officers who are desirous of entering and who are recommended. The course begins in the first week in October and, with a break of four weeks at Christmas, continues till the end of March.

The school is situated in Houghton Street, Aldwych, just behind the quarters of the Air Ministry in Adastral House, Kingsway, and forms part of London University. It has an international reputation second to none, and students flock to it from all parts of the world. So popular has it become that the various countries have to be rationed as to the number of students they are eligible to send. The students themselves are of both sexes and of all colours and ages. A special series of lectures is arranged for the Army class to which only members of the class are admitted, but the latter may attend any of the ordinary lectures and classes given in the school. In practice it is found that the special lectures are as much as the ordinary brain can absorb, and very few members of the Army class attended any lectures beyond their own special ones.

A large room is placed by the school at the disposal of the Army class

as a common room and study, and this contains a library of books dealing with the subjects of the course. The school possesses a series of libraries in which is contained every book that has been published touching in any way on economics. In fact, I believe this library is one of the most complete now existing. Adjoining the common room is the refectory, where meals of good quality and phenomenal cheapness may be obtained. Personally I preferred to walk to my club for lunch every day, but many of the class lunched at the school and put in quite a lot of work before the afternoon lecture at 2.30 p.m. Tea was served in the common room and was quite excellent. The following are the subjects upon which courses of lectures were given, and from this list it will be realized that the course is a most comprehensive one and embraces subjects that are a closed book to the average Army officer.

(1) *Public Administration.*—Five lectures were given in this subject by Professor Laski, dealing mainly with the British Legislature and Executive.

(2) *Economic Problems of War.*—Mr. Robbins gave nine lectures on this very difficult and complicated subject. Sir William Beveridge, the director of the school, was to have given some of them, but his appointment to the Coal Commission prevented him from doing so. He, however, gave one very good public lecture on the subject after the Commission had made its report.

(3) *Accounting and Business Methods.*—This subject was, to many, the hardest in the syllabus. Professor Dicksee delivered fifteen lectures and also set sums and problems to be answered between times. I would advise any officer to break the back of this subject before starting the course, as otherwise it takes up so much time that one is apt to get behindhand with the other, and more interesting, subjects. A most excellent little book is Pitman's "Elementary Book-keeping" by Buxton, published at two shillings, and if one could have worked through this book carefully beforehand I am sure the lectures would have been more intelligible and the sums less of nightmares. In the end I found that I really knew this subject better than any other, but I admit that I had to work quite hard to effect this result. Colonel J. Hartigan, C.M.G., D.S.O., who had passed through the previous course with flying colours, recommended me to study Pitman's little book and I gratefully acknowledge the help it gave me.

(4) *Inland Transport.*—Mr. Stephenson gave ten lectures on inland transport, first taking railways, then going on to road transport and finally ending with inland water transport. To those who were particularly interested in the subject Mr. Stephenson gave an additional ten lectures on railways, attendance at which was optional.

(5) *Law of Contract and Property.*—This formed the subject for twenty lectures by Professor Gutteridge, which owing to the very engaging and humorous personality of the lecturer, were most interesting and instructive.

(6) *Sea Transport.*—A very interesting series of five lectures was given

on this subject by Mr. Clement Jones, who is not a lecturer of the University but a director of the Booth Line, and who was secretary of the committee that was sent to the Mediterranean in 1915 to report upon the shipping situation. To those of us who had served in the Mediterranean his remarks regarding the use and misuse of tonnage were of the greatest interest.

(7) *The British Constitution.*—Under this heading, Mr. Lees-Smith, M.P., gave fifteen lectures describing parliamentary procedure, the working of the party system and the machinery of local government. Mr. Lees-Smith also took the class in two batches to the Houses of Parliament, where he personally explained the various procedures taking place and also showed us over the precincts of both Houses.

(8) *Economic Geography.*—Sir Halford Mackinder, in five lectures, presented us with an aspect of geography very different from that taught at public schools. He dealt in continents, pointing out those geographical features which had, and were still having, the most striking effects on the economic development of the world. An entirely new light was thus thrown on the subject of geography, and the ordinary atlas acquired a fresh interest.

(9) *Banking and Currency.*—Dr. Gregory delivered six lectures on these intricate subjects and one's grey matter had greater difficulty in absorbing his lectures than any others. This was because the lecturer had to cover such a large extent of ground in so short a time, and one's brain had not had time to take in one sentence before it was called upon to tackle the next. However, I think most of us are now able to take a more intelligent interest in the City articles of the newspapers and realize what is meant when we read that "money was tight" or "fine bills were in demand."

(10) *Raw Materials.*—Professor Sargent, in the course of ten lectures, dealt with the sources of supply, at present and in the future, of coal, iron ore, oil, timber, wheat and (by special request) rubber. He also gave us a short dissertation on hydro-electric power. These lectures were of great interest and, amongst other things, made me feel that investments in oil undertakings were necessarily much more speculative than those in rubber companies, provided the latter were situated in the right part of the world.

(11) *International Institutions.*—Professor Baker, in the course of five lectures, traced the origin of the League of Nations and gave a most interesting account of its organization and mode of procedure. Most of us had not realized how much the League has already accomplished in the way of settling disputes and what a real power in the world, in spite of the recent set-back at Geneva and the American Ambassador's gloomy forebodings, it has become.

(12) *Social Institutions.*—Mr. Lloyd gave five lectures on the history, aims and working of Trade Unions. To my mind this was one of the best thought-out series of lectures that we had and gave one a very good idea as to the causes of industrial unrest at the present time, and the reason why it is so difficult to discover a remedy that will be accepted by both the employer and employee.

(13) *Army Control.*—That veteran lecturer, Professor Graham Wallas, only gave us four lectures on Army Control, but they were both humorous and instructive. It was difficult to realize in what a chaotic state the Army was even in Crimean days, and it was sad to hear the lecturer state that most of the wine and malt liquor ordered for the patients in hospital, found its way down the throats of the medical officers.

Each lecture lasted about an hour and was followed by a discussion lasting for half an hour or longer. The lecturers were all experts in their particular subjects and never appeared at a loss for an answer to the numerous questions, intelligent or otherwise, with which they were bombarded during the discussion. It was necessary to take rough notes of each lecture and then write them up afterwards. Some of the lecturers were harder to take notes from than others—thus, Professor Laski, although he said he had throttled down his rate of speaking to half speed, produced such a flow of oratory that it was most difficult to get down intelligent notes. On the other hand, Mr. Lees-Smith always dictated a précis of his lecture which saved us the labour of having to re-write the notes on his lectures. In addition to the formal lectures detailed above various experts gave us informal talks on subjects of topical interest; thus a member of the late Duma talked about the conditions in Soviet Russia, Dr. Hugh Dalton, M.P., talked on the capital levy as a means for reducing the burden of the national debt, etc. Visits of observation were paid to such places as the London Docks, the G.W.R. works at Swindon, the General Omnibus repair works at Chiswick, the *Times* printing works, etc.

I hope the above notes will give readers some idea of the scope of the course. I have omitted to mention, however, that there is unfortunately an examination in all the subjects at the end of the course. I say "unfortunately" because I do think that the examination spoils the course by making one cram up examination points instead of allowing one to dip rather more deeply into the various subjects, which one could do so easily with the wonderful libraries at one's disposal. The object of the examination is no doubt to make the officers work, and in this it is certainly most successful, but I would venture to suggest that if the system of writing essays on the different subjects were further extended, officers would still have to work as hard but they would not have that uneasy feeling that is engendered by the thought of a formal examination. Under the present system we had to write several essays, and I can see no reason why this should not be extended to every subject. Notwithstanding the examination, however, I must say that I really enjoyed the course. I think it most important that, if possible, none but volunteers should be selected for the course as it is essential to have the right point of view to start off with. It is not a cheap course as one naturally drops any extra pay during that period, and living in or near London is always rather more expensive, but, speaking for myself, I have no regrets that last August I summoned up courage to send in my application to be considered for a vacancy.

Clinical and other Notes.

DISINFESTATION OF BARRACKS.

By Lieutenant-Colonel M. C. BEATTY.
Royal Army Medical Corps.
Assistant-Director of Hygiene, British Army of the Rhine.

THE following short account of disinfestation of barracks on a large scale may be of interest to officers of the Corps.

The Army of the Rhine was given only two months to evacuate Cologne and occupy Wiesbaden area, and, although there was no certain evidence that the barracks being taken over were pest-ridden, it was thought better to have a scheme in readiness in case they might be so. Amongst others, the representative of a firm in Frankfurt-a-M. called, and at an interview explained the use of a substance with the trade name of Zyklon "B." This is used extensively by the German Government and municipalities for disinfestation of buildings, flour mills, etc., and for disinfection of ships; it has also been used very successfully for ridding orange groves in Spain and Egypt of pests. The evidence produced of its efficacy was so convincing that it was decided, if needful, to use this process.

Zyklon "B" is really a siliceous earth impregnated with hydrogen cyanide, to which is added a tear gas. It is rather like grape nuts in appearance, and is put up in large tins.

As one of the forerunners of our Army in Wiesbaden I had time to investigate the condition of barracks, and, with the inventor of Zyklon "B" (Dr. Heerdt), we gained admittance on one pretext or another to barracks and schools about to be occupied by our troops, finding, as was expected, evidence of bedbugs, lice, fleas, cockroaches, in almost all of them. In cold weather bedbugs are not easy to detect, but a squirt of turpentine wakes them up and brings them out of hiding.

The gassing of buildings takes place as follows:—

After measuring the building a gang of workmen is employed to paper up all windows, doors and holes, where an escape of gas is possible. As soon as this is completed the gas party commences work; first to mark out with chalk on the floors how many tins are required for each room. The required number of tins are then opened outside by means of a special instrument, the top removed and replaced by a rubber cap. The tins are then carried into the building and placed inside the rooms. After the distribution the party put on gas masks and commence at the top of the building to empty the tins on the floor. When the workers are all accounted for the last door is locked and papered.

After the lapse of six hours the gas has been sufficiently effective with a concentration of 1 per cent., providing the temperature in the building is not under 50° F. If lower the building must be heated, for heat is necessary to stimulate the respiration of all insects.

After six hours the gas party protected by masks again enter the building and open up all doors and windows. Even during ventilation it is necessary to have the building sufficiently heated, otherwise the gas would remain too long on walls and articles inside the rooms. Ventilation is finished as soon as a gas test with windows and doors closed proves to be negative. The test is done with white blotting-paper wet by certain chemicals, the paper turning blue in the presence of minute traces of hydrogen cyanide.

The whole procedure in large barracks from the beginning of the papering to the handing over of the building takes about five to seven days. When the weather is favourable, dry and windy, this time is shortened.

As to the result—up to date of writing, almost two months after the first building was gassed, no pests have been detected. The entomologist of the New Museum, Wiesbaden, kindly carried out experiments on the first occasion and reported as follows:—

"When the Lorcherschool was being disinfected I placed bedbugs (*Cimex lectularius* L.) in all stages of developing from egg to adult, in different rooms.

"Test in Room No. 16. Test tube fitted with cork.

"Test in Room No. 30. Test tube fitted with wadding.

"Test in Room No. 35. Test tube fitted with cork, tube placed in a second (tin) tube, and this again in a wooden tube.

"After disinfection, it was proved that all eggs and bugs were destroyed."

It is essential to have a well-trained and very reliable staff to carry out this method. Hydrogen cyanide is an extremely deadly gas and therefore at all times it is very dangerous. This method is so very simple and so easy to work, that it is doubly dangerous, and this is really the only drawback to its use in the Army. Two of my sanitary assistants were trained in its use, but were not employed because of the size of the operations carried out, the short time allowed between evacuation of barracks by the French and our occupation, in places fifty miles apart, and also the feeling that one slight error in judgment or slackness probably resulting in a death would cast a shadow on the entire operation.

Given time and a trained staff one can see a future for the use of Zyklon "B" in the Army, for ridding barracks and hospitals, especially in tropical countries, of pests, and one has in one's mind now, the wards of a certain large hospital where bugs used to drop from the high-painted ceilings on to the patients and the nursing sisters. That hospital is still in use and it is presumed the bugs are still dropping. By this method the building could be easily cleared of the pests.

Bedsteads and furniture, blankets, etc., can easily be done in any room set apart for this purpose.

This is not a cheap process.[1] Zyklon "B" can be purchased from the firm and if used by our own trained men the cost would be considerably lessened.

In conclusion, a few remarks about the chemical and physical nature of hydrogen cyanide in contradistinction to sulphur dioxide, which is generally used for destruction of vermin.

The diffusion capacity of hydrogen cyanide is only just inferior to that of H_2 and CO_2. To this circumstance and to the extraordinary venom with which hydrogen cyanide attacks living objects, cyanide owes its good results in practice.

The gas penetrates even the smallest cracks and where a bug can penetrate the gas can follow; that eggs are as effectively dealt with as adults has been proved by Newstead.

Furniture and foodstuffs are unaffected owing to its chemical inactivity.

Sulphur dioxide on the other hand, has the disadvantage of a heavy specific gravity, and its diffusion capacity is very low. On account of its specific gravity it does not mix readily with air, especially in upper parts of a room. Even if it reaches the ceiling it has been proved that seventy-five per cent of the gas will be absorbed by the chalk and become non-effective. Action on living objects is less. In addition it has a detrimental action on very many articles of furniture and on fabrics, on which it remains as sublimated sulphur.

A CASE OF MYIASIS OF THE TEMPORAL BONE.

By Major E. A. SUTTON, M.C.

Royal Army Medical Corps.

The patient, Mrs. D., was admitted to the Military Families Hospital, Belgaum, on May 11, 1925, suffering from extreme pain in the head and a temperature of 104·6° F.

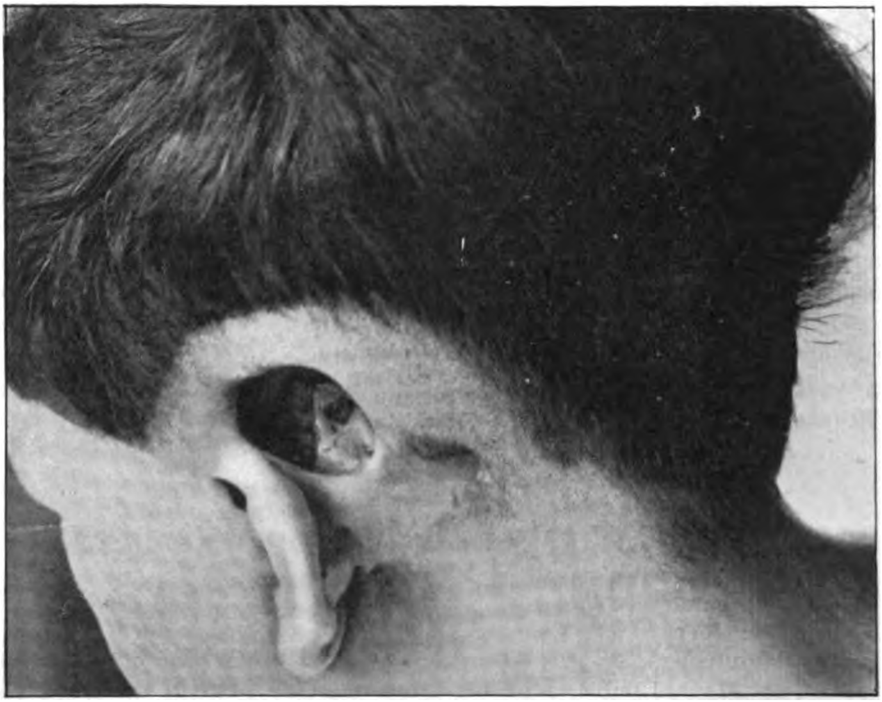
On the removal of "home-made" dressings, an open, deep and foul-smelling wound was found behind the left ear, and in this larvæ were seen moving about. The débris in the cavity was syringed out with hydrogen peroxide, and it was then seen that a very large number of larvæ were attached to the walls of the cavity and boring with a very active and "vicious"-like corkscrew motion. The activity of the larvæ was such as to suggest extreme hunger and a determination to get food at all costs. They were holding on so tightly to the tissues that an attempt to forcibly remove one with forceps only resulted in increasing the pain and rupturing the larva.

---

[1] Approximately 525,000 cubic metres have been gassed in this area.

The cavity was then flooded with a solution of anæsthetic chloroform and water (1—25); cerebral pulsation was then distinctly noticed. Contact with the chloroform solution was allowed for about ten minutes and the cavity then drained. One hundred and thirty-seven larvæ were picked out with forceps. Most of these were dead but six showed signs of life, and an unsuccessful attempt was made to breed these out on some decaying meat.

The destruction of the tissues, as will be seen from the photograph, was frightful. Almost the entire petrous portion of the temporal bone was gone and the damage was dangerously approaching the lateral sinus. The



dura mater was exposed in places. A probe passed through the external auditory meatus emerged into the cavity.

The patient was extremely ill for a week, and for the first four days the pain was so intense that she had to be kept continually under the influence of morphia. Under antiseptic irrigations and packings of iodoform gauze the cavity cleaned up and a little granulation commenced. This has now practically ceased and the final closing of the cavity appears to be doubtful, but it will be seen from the photograph that the skin edges are turning in, and possibly the entire cavity may in time become lined with skin.

The patient's history was that in 1918 she had an abscess behind the ear which left a small discharging sinus behind. On this the fly must

have deposited her eggs, and neglect of personal hygiene on the part of the patient did the rest. She had been complaining of pain behind the ear for nearly three weeks before admission, but thinking it was only due to the old trouble had refused to allow her husband to call a doctor. Three days before admission the "swelling" burst, but the husband did not notice any larvæ.

The case is, I think, of interest partly on account of the infrequency of the condition in Europeans, and also because it shows the speedy and frightful destruction caused by the larvæ of these flies and consequently the importance of carefully covering even trivial wounds and abrasions in places where such insect pests exist.

The larvæ were about two-thirds of an inch long, consisted of twelve segments, each of which was encircled by a row of small spines which could be felt better than seen. Specimens were sent through the Curator of the Bombay Natural History Society to the Imperial Entomologist, Pusa, who identified them as larvæ of *Chrysomia bezziana* (Villeneuve).

A case of myiasis of the frontal sinus and orbit occurring in a native was reported by Major R. E. Wright, I.M.S., in the *Indian Medical Gazette* of February, 1921. In his entomological note on the case, Major W. S. Patton, I.M.S., describes this fly as the specific myiasis-producing calliphorine of India which only deposits its eggs in the diseased tissues of man and animals.

A CASE OF HEAD INJURY.

By Captain E. UNDERHILL.
Royal Army Medical Corps.

The following case presented a train of symptoms sufficiently uncommon to appear to merit a brief description:—

The patient, a boy, aged 3 years and 1 month, was carried to hospital at 7.30 p.m. on March 31, 1925, in a "convulsion."

At about 5 p.m. that evening he had fallen down some steps leading from the verandah of the quarters, a height of about eighteen or twenty inches, and in falling struck the side of his head against the corner of a higher step.

The mother of the patient was quite positive that it was the *right* side of the head that was struck.

The child got up, went to his mother, and asked to be picked up. When she had done so he lay absolutely still in her arms, which, she subsequently stated, was unusual, and she noticed his eyes fixed and his hands cold. Convulsions started on the way to hospital. The child did not vomit.

On admission the condition present was as follows: Complete uncon-

sciousness; constant, convulsive, jerky movements of the right hand and leg, with twitching of the right side of the face. The patient's temperature was 101° F. The pulse-rate was 124, but the pulse was very good in quality and normal in strength and softness. Breathing was difficult, respirations being slow but not noisy. Cyanosis was present. The face was not drawn nor pinched. The head was slightly turned to the right. Both eyes were directed to the right and were fixed. The muscles of the back of the neck were rigid. A slight bruise was found on the left side of the head in the upper part of the parietal region. No fracture of the skull could be felt.

There was no sign of hæmorrhage or escape of cerebro-spinal fluid from nose or ears; and neither then nor subsequently any subconjunctival ecchymosis.

The patient was placed in a warm bath with an ice-bag applied to the head, cold water was allowed to trickle down his back, and a glycerine enema was administered. After about ten minutes his breathing became easier and more natural and his colour improved. The convulsions continued. A motion was passed in the bath.

The patient was then taken out of the bath. Owing to returning dyspnœa and cyanosis, a few movements of artificial respiration were undertaken. As no improvement was effected by this measure, the patient was again placed in the bath, simple manual compression and relaxation of the chest continued, and douching of the back with cold water recommenced.

Dyspnœa and cyanosis continued for about twenty minutes, alternately improving and returning as artificial respiration was performed for two or three minutes at a time or stopped. Convulsions continued constant.

Three grains of potassium bromide in solution were then given and followed in a few minutes by complete cessation of convulsions and twitchings, the breathing becoming easy and natural, cyanosis disappearing, the neck relaxing, and the patient lying quite still and quiet.

This convulsive stage continued from about 7 p.m. until about 8.30 p.m. During this period the left side was limp, the convulsions affecting the right side only.

The convulsions were succeeded by a stage of paralysis which supervened gradually, taking about half an hour to become fully developed. The condition when developed fully was one of right-sided hemiplegia of the flaccid type involving face, arm and leg, and apparently complete in so far as those parts were affected, the face being drawn to the left and the limbs absolutely limp. The plantar reflexes were absent at first; a little later on a flexor response was obtained on the right side. The other reflexes, skin and tendon, were absent, no reaction being elicited on the application of the usual tests.

The pupils were equal and regular, neither noticeably dilated nor contracted; but the right was thought to be slightly dilated, and, at first,

slightly and sluggishly reacting to light, the reaction subsequently becoming lost. The left eye appeared to be deviated slightly outwards.

The attitude and behaviour of a case of cerebral irritation were not displayed, and the characteristic pulse and respiration of cerebral compression were not present.

At 3 a.m. the patient was given a soap and water enema, which was followed by a very satisfactory motion. Thereafter he passed into a state resembling sound, natural sleep.

He woke at 6 a.m. seeming very drowsy; was given a drink of milk and water, which he took quite normally, and fell asleep again. About 7 a.m. he vomited once after partially regaining consciousness, and vomited slightly on four more occasions during the day, vomiting once on each occasion easily without straining. All that day (April 1) he was drowsy, with occasionally twitching of the fingers of the right hand.

The next day (April 2) the patient had recovered except for slight paresis, and otherwise seemed normal. His first remark on gaining consciousness was, "I fall down."

He was kept under observation until April 9 and was then discharged from hospital perfectly normal. He was seen some months later and was then apparently quite normal, and has so continued up to the time of writing, six and a half months after the accident.

The case presented certain features which seem worthy of remark:—

The absence of the classical general signs of irritation and compression, the very transitory nature and shortness of duration of the severe symptoms, and the rapid and complete spontaneous recovery of the patient appear to indicate a diagnosis of concussion. On the other hand, the association of convulsions and definite paralysis with concussion would appear to be very unusual, to judge by the meagreness and brevity of references to the subject contained in the ordinary textbooks in common use. No mention was found in Rose and Carless. Thomson and Miles, in the sixth edition of their "Manual of Surgery," remark that in concussion "although voluntary movement and the deep reflexes are abolished, there is no true muscular paralysis." In this present case the complete flaccidity of the right side in comparison with the left was quite definitely marked—the muscles felt to be more completely relaxed and toneless when handled, the right limbs "flopped" and crumpled up when raised and released, whereas the left did not, and the usual appearance of paralysis was notably displayed in the face in "flattening" of the right side and drawing of the features to the left. Thomson and Miles do not mention convulsions as occurring in connexion with concussion. They add further, however, that "effusions into the cortical motor areas give rise to irritation or paralysis of the muscles governed by the affected centres." Yet in this case it seems difficult to understand how the effects of an effusion, if present, sufficiently definite to

give rise to such depth and severity of symptoms should be of such short duration and pass so quickly and completely away.

Sargent, in the chapter on Cranial Injuries in the "Practitioner's Surgery," edited by D'Arcy Power, writes that "increased intercranial pressure is certainly present in many of the more serious cases of concussion, and this accentuates the difficulty of distinguishing between concussion pure and simple and concussion complicated by intracranial hæmorrhage." This statement seems to describe the condition under consideration. He also remarks that in cases of concussion "sometimes reaction is ushered in by a mild epileptiform seizure." This is his only direct reference to "convulsions" accompanying concussion, and may be held to apply to the occasional twitchings observed in this case on April 1, though it would hardly explain the convulsions of the previous day. He further mentions "increase in the muscular flaccidity, especially if asymmetrical on the two sides of the body," as one of the signs pointing "to the probability of laceration of the brain or meninges with progressive hæmorrhage." This was the only sign of those he mentions which was certainly present in this case, though there was also doubtful "inequality of the pupils coming on under observation," and the conjugate deviation of the head and eyes which was present was also suspicious of a gross cortical lesion.

I am indebted to Lieutenant-Colonel G. A. K. H. Reed, R.A.M.C., Officer Commanding, British Station Hospital, Kamptee, for permission to record this case.

AN ACCOUNT OF TWO CASES OF RUPTURE OF THE SMALL INTESTINE.

By Captain M. MORRIS.
Royal Army Medical Corps.

We are called upon so rarely to treat and deal with severe abdominal injuries that I feel a short report on the following cases will be of interest.

During the last hot weather I was asked to see a man at the Indian Station Hospital, Jubbulpore, who, it was reported, had fallen off a haystack and transfixed his abdomen with a pitchfork. I found the man to be a Hindu syce, aged 32. He gave the following history; "I was standing on a cart piling up hay with a pitchfork from a haystack. The cart was shaking and I fell off to the ground. I found that one prong of the fork had entered my abdomen, so I pulled it out and walked about a mile to see my sahib." The officer concerned informed me that the man walked into his orderly room, pulled up his garments and displayed a loop of intestine. The patient then collapsed and was taken by ambulance to hospital. The accident took place about 8.30 and I saw the man at 10.30 a.m. His general condition was then, taking everything into consideration, quite

good—pulse 100, temperature normal. Inspection of the abdomen showed a punctured wound in the right iliac fossa about two and a half inches above and internal to the anterior superior spine; prolapsed through this was a knuckle of small gut, strangulated, nipped and turgid in colour. There was a similar punctured wound in the left loin in a position which would have been the centre of a convenient incision for exposing the kidney. There was no hæmorrhage or leak from the wound. The man informed me that the fork had passed right through his abdomen. I have been unable to collect eye witnesses or get a clearer account of the accident. He had not taken food for some eighteen hours previously and had not passed urine since the accident. The abdomen was generally extremely rigid and tender. I cleaned up the loop of intestine with saline, but was unable to replace it, so proceeded to have chloroform administered. The bladder was then catheterized—the urine was normal, so I had great hopes the left kidney had escaped. I first gently replaced the prolapsed loop of intestine and then opened the abdomen by means of a large incision through the right rectus muscle. I found that the knuckle of gut replaced through the punctured wound had regained its colour and appeared healthy. The coils of small intestine were empty and contracted. The great omentum at one part was bleeding freely. I ligatured the bleeding points and then systematically and rapidly passed the small gut through my hands. The ileum was punctured in three places about six inches from the ileo-cæcal valve. Two wounds were about four inches apart on opposite sides of the gut. The mucous membrane was pouting through the puncture and intestinal contents oozed out of it. The other puncture was about six inches higher up in the ileum. I repaired these punctures with continuous sutures in two layers at right angles to the long axis of the bowel. I was unable to find any signs of injury to the descending colon or left kidney and there was no retroperitoneal hæmorrhage or collection of fluid. Hastily cleaning the peritoneal cavity with swabs wrung out of hot saline and excising the wound in the abdominal wall, I closed the incision, leaving a tube down to the pelvis. I then excised the wound in the left lumbar region and put a tube in this down to the peritoneum. The operation took forty-five minutes. The patient was put to bed in Fowler's position and given continuous saline per rectum for forty-eight hours with an improvised apparatus. I then gave him 500 units of antitetanic serum. The tubes were repeatedly shortened and finally removed by the fifth day. The remainder of the convalescence was without incidence or interest. The man made a good recovery and in six weeks was doing his work as a syce. His bowels have given him no trouble and he is perfectly fit.

The prognosis of traumatic perforations of the small intestine is, in my opinion, so bad that the above case was most encouraging. The fact that the intestine was empty and that this Hindu was a poor man and rarely ate meat may have been important, but, contrasting the result with the following case, prognosis in these cases is very difficult.

I was called to see a British driver of the R.F.A. who in riding school had been momentarily pinned to the ground by a rearing horse coming back on him. The pummel of the saddle had pressed on his upper abdomen. He was conveyed to hospital within fifteen minutes of the accident and I was in my ward when he was admitted. He was in great pain and the abdomen was very rigid and tender over the upper part of the right rectus muscle. I treated the case for shock, and one and a half hours after admission, during which time I had prepared the theatre, was convinced that he had a perforation of a hollow viscus. Laparotomy revealed a small tear in the upper part of the ileum. The operation consisted of repair, toilet of the peritoneum and drainage. The patient never rallied and died twelve hours after operation. The post-mortem showed general early plastic peritonitis.

The prognosis in this case appeared to be far better than in the former.

Current Literature.

Anatoxin Dysentérique. By J. Dumas, Ramon, and Said Bila (*Annales de l'Institut Pasteur*, 1926, i, 134). It has been shown that for dysentery (as for diphtheria) a substance which has been named anatoxin can be produced by adding formalin to the toxin produced by the organism and incubating in a definite way. This anatoxin differs from true toxin in that it produces little or no reaction when injected into man or animals; despite which it retains the antigenic properties of true toxin and is consequently capable of stimulating the production of antitoxin.

The toxin is prepared (for Shiga's bacillus) by growing the organism aerobically for fifteen days in a special fluid medium. At the end of this time the culture is filtered, and the strength of the toxin (filtrate) tested by animal inoculation, 1 c.c. killing, with definite symptoms, a rabbit of two kilos in three to four days.

To one litre of this toxin 6 c.c. of formalin (40 per cent formaldehyde) are added, and the mixture is placed in the incubator at 37° C. The attenuation of the dysentery toxin is gradual: after fifteen days 5 c.c. are necessary to kill a rabbit, and after thirty days 10 c.c. fail to produce a fatal result.

The antigenic properties of anatoxin thus prepared are demonstrated by subcutaneously inoculating a rabbit at an eight-day interval with doses of ½ and 1 c.c. Two weeks after the second injection such rabbits remain alive after the intravenous injection of 4, 6, and sometimes 8 lethal doses of toxin, or the subcutaneous injection of 4 lethal doses of a virulent broth culture of *Bacillus dysenteriæ* Shiga.

The serum of such immunized animals has no power of agglutinating *B. dysenteriæ* Shiga, nor of giving a precipitin reaction. .

A feebler degree of immunity can be conferred by causing the animal to swallow anatoxin.

Horses have been immunized with anatoxin, giving doses of 10, 25, 50, 100, 250 and 500 c.c. With the larger doses the animal has slight local and general reaction, but the symptoms rapidly disappear. This is in marked contrast to the state of affairs which obtains where ordinary unformalized toxin is used for producing antitoxin, when the general and local reactions are intense, so that it is impossible to exceed a dose of 50 c.c. of toxin.

The serum of horses immunized with anatoxin rapidly acquires antitoxic properties, and in dilutions of from 1/200 to 1/400 in different cases is capable of neutralizing 6 lethal doses of toxin (the mouse here is used as a test animal).

A point of great interest is that Ramon's *in vitro* method of ascertaining the neutralizing dose of antitoxin for its toxin (reviewed in this journal, 1925, xxxix, 311) has proved equally satisfactory in the standardization of dysentery toxin and antitoxin.

Experimental inoculation of man has also been carried out. There is a slight local reaction, much less than that following antityphoid inoculation after three or four days, after both the first injection of ½ c.c. and the second of 1 c.c. There is no general reaction. In three weeks the patient's serum has marked antitoxic properties, 0·2 c.c. of the serum neutralizing, according to the degree to which the patient responds, 1, 3 or 4 lethal doses of toxin for the rabbit. Normal human serum has no such action. The patient's serum has no agglutinating nor precipitating reaction towards the dysentery organisms or their products.

The crucial experiment of testing the protective powers of an inoculation with dysentery anatoxin during an epidemic of dysentery has yet to be made. J. E. M. B.

Fish as the Source of Certain Coccidia recently described as Intestinal Parasites of Man. By J. G. Thomson, M.A., M.B., Ch.B., and A. Robertson, M.B., Ch.B. (*British Medical Journal*, 1926, i, 282).

Experimental Passage of the Oöcysts of Fish Coccidia through the Human Intestine. By the same authors. (*British Medical Journal*, 1926, i, 420).

On a few rare occasions the oöcysts of coccidia of the genus *Eimeria* have been described in human fæces, and in Dobell's "Intestinal Protozoa of Man," 1921, three species are described, viz., *E. wenyoni* Dobell, 1919, *E. oxyspora* Dobell, 1919, and *E. snijdersi* Dobell, 1921.

As there was a certain amount of evidence that these oöcysts might have been swallowed in the food, and as the article of diet most likely to contain these organisms was fish, an investigation of the coccidia of fish was carried out. As the result of this the authors conclude that *E. wenyoni*

is really *E. clupearum* Thelohan, 1894, whilst *E. oxyspora* and *E. snijdersi* are synonymous with *E. sardinæ* Thelohan, 1890.

E. clupearum was found in 100 per cent of the livers of herrings, and was also present in the same organ of sprats and mackerel. *E. sardinæ* occurs in the testes of sprats, herring and mackerel, and has also been found in tinned sardines imported from Portugal, and tinned soft roes of herring from Norway.

To prove that the oöcysts could pass unchanged through the human alimentary canal, a volunteer was first purged and then given a liberal meal of fried herring testes infected with *E. sardinæ*. Next morning oöcysts corresponding to these described from human fæces were recovered from his stool.

The three species of *Eimeria* must thus cease to be regarded as human parasites. J. E. M. B.

"Technic of Use of Removable Radon Seeds in Carcinoma of the Tongue." Abstract by Joseph Muir. *Annals of Surgery*, Philadelphia May, 1926. Vol. lxxxiii, page 598.

This article describes a new technique of radium therapy in lingual carcinoma which offers a practical means of irradiating even the most inaccessible tongue lesions. This is accomplished by the implantation of removable platinum radon seeds. As the methods of treatment heretofore used have always proved unsatisfactory, this article is of especial importance from a clinical standpoint.

The various methods by which lingual carcinoma has previously been treated are discussed and their advantages and drawbacks considered. Imbedding of bare tubes according to Janeway's method affords an even distribution of radiation, but causes necrosis which is invariably followed by sloughing and may even induce unavoidable fatal hæmorrhage. If screened seeds are used, necrosis is avoided, but they are objectionable because they must remain in the tongue as foreign bodies. The platinum needles advocated by Regaud also obviate necrosis and can be removed when radiation has been accomplished, but proper distribution of these applicators is very difficult; they cause too much trauma; and, above all, they are hard to immobilize and cannot be placed upon the posterior dorsal surface of the tongue.

The method offered in this article obviates all these difficulties, while retaining every desirable feature. The seeds are completely screened with platinum, thus doing away with necrosis and sloughing; they are easily withdrawn after adequate dosage has been delivered, so that they do not remain in the tissue as foreign bodies. These seeds can be placed in any position required, just as readily in the hitherto inaccessible "root" of the tongue as in more favourable positions. The article is profusely illustrated, demonstrating the exact method of approach to these inaccessible lesions.

The growth is first carefully palpated, and the number of seeds required determined according to its depth and surface extent. When a seed has been placed in the desired position the attached thread is left protruding from the point of entry, where it is cut off so as to leave just enough to be readily grasped with forceps at the time of removal.

The entire treatment causes no pain and but slight inconvenience to the patient, and when skilfully performed under proper aseptic precautions, the technique offers an excellent means of solving one of the most vexing of clinical problems.

Reviews.

BULLETIN OF HYGIENE. Vol. 1. Nos. 1 to 4. Bureau of Hygiene and Tropical Diseases, 23, Endsleigh Gardens, W.C. Price 2s. 6d. net.

The *Bulletin of Hygiene* is issued under the direction of the Honorary Managing Committee of the Bureau of Hygiene and Tropical Diseases; it contains summaries and reviews of publications on all branches of public health and preventive medicine and is intended to meet more particularly the needs of Britain overseas.

The list of contributors contains such well-known names as Dr. W. G. Savage, Dr. Harold Scurfield, Professor W. W. C. Topley, Professor E. Mellanby, F.R.S., Dr. W. M. Willoughby, Dr. W. McC. Wanklyn and Dr. R. A. Lyster, and amongst the reviewers we notice Sir William Willcox and Dr. L. C. Parkes. In such capable hands the Bulletin cannot fail to be a success. Publication was commenced in January, 1926, and four numbers have so far been printed. The first number contains summaries of papers on: Dental hygiene, immunity and bacteriology, milk, small-pox and vaccination, maternity and child-welfare, hygiene of the tropics, Dominion and Foreign Reports and reviews of books. In other numbers there are additional sections dealing with food, water, cancer, venereal diseases, scarlet fever, measles, veterinary diseases in relation to man, vital statistics and epidemiology, sanitary law, ventilation, lighting and climatology. The mere mention of all these subjects shows the extent of the ground covered by the Bulletin.

Dr. T. F. C. Haslam, Assistant Director of this Bureau, is responsible for the section on hygiene in the tropics, and gives extracts from publications in various languages. With this exception the Bulletin will for the present be mainly restricted to publications in the English language. If sufficient support is received it is intended to include French and German literature next year. We have read the four numbers with pleasure. The extracts, as would be expected, are admirably done, and the publica-

tion cannot fail to be of great service to all workers in Public Health and especially to those residing in our Colonies and the Dominions.

We hope the Bulletin will receive the support it so well deserves and that next year its scope will be enlarged by references to foreign literature.

IMMUNOCHEMICAL STUDIES. Edited by Carl H. Browning. London: Constable and Co., Ltd., 1925. Pp. xiii and 239. Price 16s.

This is a composite work to which contributions have been made by the Editor, and Drs. M. Kosakai (Japan), T. J. Mackie (Edinburgh), T. Taniguchi (Japan), G. H. Wilson (Birmingham), and N. Yoshinare (Japan). Most of the subject matter which it contains has been previously published in one or other of the scientific journals, and the object of the book is to present in collected form the more recent research work on immunology which has been carried out by the Glasgow School.

The book has a detailed table of contents, but no index, an omission which at first sight is a trifle startling, but which is shown by a moment's reflection to be more than justified, as the constant repetition of technical terms negatives the value of such a guide.

This is not in any sense of the term a textbook on immunology, dealing with every aspect of the subject. It is rather the record of a series of investigations carried out to elucidate a few of the more obscure phenomena which have presented themselves from time to time during the study of immunological reactions. It cannot therefore be recommended to those who have not already a fairly considerable knowledge of the subject, as it presupposes an acquaintance with technical terms and definitions which the average medical man (rightly) does not possess. Nor is it a work to be approached in a casual fashion by the expert. But if it be read, and read again, until the significance of the experiments and of the conclusions is fully grasped, it will more than repay the study not only because of the interest of the results but also by reason of the vista for research which it opens out to anyone who commands no greater facilities than those necessary for carrying out the Wassermann reaction.

To link together the various units of which the work is built up, the Editor has written an introductory chapter which summarizes the scope of the investigations.

Chapter II is devoted to the antigenic properties of globin and hæmoglobin, particularly the former, which lends itself to the study of specificity of antigen and antibody. Using this antigen and its appropriate antibody, the effect of hydrogen-ion concentration on the absorption of complement was investigated. It was found that when the medium was faintly acid much more complement (in one case four times more) was absorbed than when the medium was faintly alkaline.

The next chapters deal respectively with "Mature and Immature Antibodies," "The Constitution of Normal Hæmolysin," "Conglutination,"

and "The Effect of Osmic Acid on Receptors." A chapter on "Heterophile Antigen and Antibody" is of special interest in its bearing on (*a*) primary anaphylaxis, and (*b*) the Wassermann reaction.

It has been shown that the injection into a rabbit of emulsions of organs of certain animals (e.g., guinea-pig kidney, to quote a single instance of many) leads to the appearance in the serum of the rabbit of an immune body which not only fixes complement in the presence of an emulsion of *any* of the organs capable of generating it, and gives a precipitin reaction with extracts of these organs, but which also acts as a hæmolytic immune body for sheep's corpuscles. This "heterophile" antibody, as it is called, was at first thought to disprove the specificity of antigen and antibody. Further research showed that such is not the case. Tissues which are capable of stimulating the production of heterophile antibody when injected into the rabbit do so by virtue of a substance common to them all, which has been named "heterophile antigen." Heterophile antigen is present in sheep's corpuscles, hence the lytic action exercised on these by heterophile antibody. This heterophile antigen is shown to be distributed in a peculiar but very definite and clear-cut fashion in certain organs and tissues of certain species. It is present in such widely divergent species as, say, the horse and the tortoise, whilst it occurs in the mouse, but not in the rat. The organs and tissues of man, rabbit, ox, and sheep (except sheep corpuscles) are devoid of this property.

As regards anaphylaxis, it has been found that certain antisera show powerful primary toxicity to the guinea-pig (whose organs contain heterophile antigen), but not to the rabbit (whose organs do not contain heterophile antigen). Injected with such an antiserum, the guinea-pig dies and shows post-mortem signs corresponding to those of serum anaphylaxis, and it would appear that this result is due to the interaction of heterophile antibody and antigen. If therefore an injection of heterophile antigen be made into an animal whose serum contains a sufficient quantity of heterophile antibody, the conditions for anaphylactic shock are provided. Now human serum (like rabbit serum) normally contains limited quantities of immune body for sheep's corpuscles, which is stated by some authorities to be of the nature of heterophile antibody. Further, horse serum is definitely known to contain heterophile antigen. It seems possible, therefore, that the rare condition of primary anaphylaxis following an injection of horse serum occurs from the reaction of heterophile antigen and antibody in individuals whose serum for some reason or another contains an abnormal quantity of heterophile antibody.

As far as the Wassermann reaction is concerned, the interest lies in the close relationship between heterophile antigen and the antigen now commonly used in carrying out the Wassermann reaction. The experiments set forth show that whereas the production of heterophile antibody is stimulated by the injection of saline emulsions of tissues (say guinea-pig kidney), the most efficient antigen for fixing the antibody thus produced is

an alcoholic extract of the tissue (which is in fact an alcoholic solution of the lipoids of the tissue). The injection of this lipoid extract *per se* has no power in stimulating heterophile antibody production, nor has the injection of the protein residue left when the lipoid has been extracted from the tissue, nor has a mixture of the two. It would appear, therefore, that true heterophile antigen is a protein-lipoid complex, but that the receptor arms are present in the lipoid element, and have their action enhanced by being dissociated from the protein element by alcoholic extraction.

The similarity of these lipoid substances to the "antigen" now commonly used in the Wassermann reaction (alcoholic extract of human, sheep's, or calf's heart, and cholesterin) is striking, yet the dissimilarities are also great, as the organs used for preparing Wassermann reaction antigen do *not* contain heterophile antigen (see above). A further interesting observation is that the serum of certain rabbits has normally the property of giving a positive Wassermann reaction, and when these animals are injected with guinea-pig organs there is both a production of heterophile antibody and an increase of the Wassermann substance. The heterophile antibody can be removed by absorption, leaving the other more or less unimpaired, thus showing clearly that the two are separate. It is very patent that there is opened up here a rich field for investigation.

Another interesting observation is the property of sheep's corpuscles when injected into a rabbit, to stimulate the production of *both* heterophile antibody and "isophile" antibody (the ordinary specific hæmolytic amboceptor). The former appears rapidly after a single injection, and its action in producing hæmolysis appears to be associated with the lipoids of the sheep's corpuscles; the latter appears much more slowly, and is supposed to react with receptors of protein nature.

The next chapter deals with Opsonic Action along lines which are more or less familiar, whilst the final chapter is devoted to a series of investigations into the nature of complement. The method adopted was to split up serum containing complement, first by diluting with ice-cold distilled water and passing through CO_2, as the result of which a clear portion and a flocculum were obtained, and second by saturating with differing strengths of ammonium sulphate both the original serum and also separately the fractions split by CO_2. The elements then obtained were tested for their complementing powers separately and in a variety of mixtures, using hæmolytic systems having as amboceptors ordinary immune serum, cobra venom and silicic acid. The results do not permit of summarization here. Although some definite facts emerge, in the main issues these results are not very clear cut, and, to use the author's own words, "the conclusion is confirmed that complement is much more complex in its constitution than has hitherto been supposed."

J. S. K. B.

SURGERY OF CHILDHOOD. By John Fraser. Vols. I and II. London: Arnold and Co. 1926. Pp. 1152, with 598 figures. Price £2 2s. net.

Many officers and other ranks of the R.A.M.C. will have an appreciative recollection of the author of these two exhaustive volumes on the surgery of childhood when he was a captain of the R.A.M.C. special reserve in a casualty clearing station of the forward area in the First Army in France, especially on account of his work in an advanced operating centre and in connexion with his investigations into wound shock and blood transfusion in the field. They will also be amongst the first to congratulate him on succeeding Sir Harold Stiles in the Chair of Clinical Surgery in the University of Edinburgh, where we are confident he will prove a worthy heir to the traditions of a long line of illustrious Edinburgh surgeons. If anything were needed to add to our confidence in this respect, it will be found in a perusal of these two volumes, which are the result of his previous work as lecturer and clinical teacher at the Edinburgh Hospital for Sick Children. The subject of the "Surgery of Childhood" is not one which appeals directly to many surgical specialists in the R.A.M.C., as it is somewhat outside the lines of their usual practice, but the manner in which Professor Fraser has dealt with it gives it an importance that is far from being restricted to the surgical affections of children, and is of much wider significance. The first six chapters, for example, deal with such subjects as wounds and contusions, burns and scalds, surgical shock, transfusions and infusions, and anæsthesia. The remaining chapters of Part I of the first volume are concerned with rickets, surgical tuberculosis, congenital syphilis, fractures and separation of the epiphyses, various diseases of bones and joints and the surgical aspects of the blood and its diseases. Part II of this volume is devoted to a consideration of deformities and abnormalities of the skull, and to the surgery of the skull and its contents, of the face and mouth, and affections of the ear, nose and throat. The second volume contains eleven long chapters on the surgery of the neck, thorax, abdomen and pelvis, and of the upper and lower extremities. They are of a very exhaustive nature, and illustrate fully the many developmental errors and abnormalities, both commonly and rarely found in children, and the remedial surgical measures for correcting them. It is impossible to speak too highly of the character of these volumes. They are beautifully clear both in the text and in the illustrations, and the printing and binding are excellent. To those who are interested in the surgery of childhood we know of no work in any language which is so thoroughly up to date or so valuable as a guide in practice. Both author and publisher are to be congratulated on its production.

MODERN VIEWS ON DIGESTION AND GASTRIC DISEASES. By Hugh Maclean, M.D., D.Sc., M.R.C.P. London: Constable and Co. 1925. Pp. x + 170, with 14 charts and 23 figures. Price 12s. net.

Professor Maclean's volume is one of a series of modern medical monographs of which he is the editor. It is an attempt to give a short

and concise account of the present position of the physiology of digestion and of gastric pathology. The opening chapter contains a short but clear description of the structure and movements of the stomach. In reviewing the important problem of the regulation of the pyloric sphincter and the theories explanatory of its contraction and relaxation, the author's conclusion is that the whole problem of sphincter activity is at present only a matter of conjecture; but he lays great stress on the importance of regurgitation of pancreatic juice into the stomach as a natural physiological process for the purpose of neutralizing acidity. In describing the physiology of digestion he emphasizes the part played by this regurgitation of alkaline juices from the intestine into the stomach, and states that when this is interfered with distinctly unpleasant symptoms may be produced. In fact, the chief theme in the monograph is the importance of determining by fractional test meals and the agency of Ryle's stomach tube the amount of free and combined acid in the stomach contents. This he regards as the first step towards a diagnosis of gastric ailments, the chief of which are only four in number, namely, functional disorders, and gastritis, ulcers and cancer, constituting organic disorders. The commonest form of functional disorder is hyperacidity, the mechanism and causes of which are very clearly described. It is also the prime factor in the production of gastric and duodenal ulcer. On the other hand, there is an entire absence of acidity in pernicious anæmia, and in cancer of the stomach lactic acid replaces the normal hydrochloric acid content. These diagnostic points are well brought out in the monograph. Professor Maclean totally disagrees with the theory that cancer can or does supervene on ulcer, and produces evidence to show how entirely distinct the two conditions are in origin, diagnosis and prognosis. The last three chapters deal with the chemical examination of gastric contents and fæces, with the radiological examination of the alimentary canal, and with the treatment of gastric disorders. The style and wording of the several chapters are unusually clear and simple, much more so than one is accustomed to find in scientific treatises dealing with physiological and pathological problems. As a guide to the general practitioner the book should prove invaluable, especially with regard to the treatment and management of cases of gastric ulcer. Professor Maclean considers that the necessary condition for the healing of a gastric or duodenal ulcer is alkalinity and suitable non-irritating food. The only effective treatment, he states, is to bathe it in a non-irritating alkaline or neutral fluid free from gastric juice. What has been done extensively in the past by surgical means can with equal certainty be accomplished now by medical means. It is only when properly conducted medical treatment, such as he details, fails, that recourse must be had to surgery; but it is only in exceptional conditions that medical treatment fails. The treatment he describes is so simple and so easily applied, that gastro-enterostomy as a surgical operation for gastric or duodenal ulcer

should fade into the background under Professor Maclean's teaching. The volume is well worth inclusion in the medical officer's library.

MODERN METHODS OF AMPUTATION. By Thomas G. Orr, A.B., M.D., F.A.C.S. London: Henry Kimpton. 1926. Pp. 117. Price 16s. net.

In this work the author makes a genuine effort to standardize amputation technique and to provide brief but practical instruction for the performance of amputations at any required site; he lays special emphasis on the fact that a really good functional result is the chief desideratum. Several of the classical methods of amputation are condemned and wisely omitted.

In Chapter I the general principles applicable to all amputations are considered.

Long anterior and short posterior flaps are recommended for the lower limb and flaps of equal length for the upper. Muscle flaps are not advocated, but it is advised that in all cases the divided muscles should be grouped round and attached to the bone to prevent retraction, and that the deep fascia should, wherever possible, be a covering of the stump and stitched over it. Nerves should be drawn down, injected with 95 per cent alcohol and divided as high as possible and the periosteum thoroughly removed from the distal half inch of the bone.

Careful splinting is necessary to prevent flexion deformity and early full range of motion at the nearest joint is advised.

Chapter II deals with amputation stumps, the causes of tenderness are enumerated, and the ideal scar and the steps to be taken to obtain such a scar are described.

In Chapters III and IV the author describes his standard amputations of the upper and lower limbs respectively. The sites of choice and technique of each operation are given. The operations of Chopart, Pirogoff and Stephen Smith are condemned, but those of Syme and Lisfranc approved.

The book concludes with a short article on cinematoplastic amputations and one on artificial limbs, both of which are fully illustrated.

In the former is given a description of the methods adopted to provide by operation artificial points of attachment on the stump, or plastic motors, to which cords are fixed to transmit movement to the artificial appliance. Whilst admitting the difficulty in determining the practical value of these operations at present, the author registers a plea for their further trial.

In the latter various forms of provisional and artificial limbs are illustrated and the necessity for bearing in mind the following points is emphasized:—

(1) The need for co-operation between surgeon and instrument maker.

(2) Full consideration of the patient's employment.

(3) The advisability of early application of a temporary splint.

(4) The advantages of early training of "amputés" in the use of their limbs.

Though not claiming to be an exhaustive treatise on the subject of amputation, the book should receive a warm welcome from surgeons who have to choose the most suitable amputation for any individual case, and need some help in performing it.

H. C. S.

THE MEDICAL ANNUAL: FORTY-FOURTH YEAR, 1926. Bristol. John Wright and Sons, Ltd. London: Simpkin Marshall, Hamilton, Kent and Co. Pp. ciii + 616. Price 20s. net.

The 1926 volume of this Annual, its forty-fourth edition, reviews the work of the profession and provides a dictionary of advances made in the past year. It states that it is intended to provide "ammunition to the men in the firing line of the war against disease." The three kinds of attack that are specially brought to notice are provision of means for the successful treatment of the individual case, new methods of early diagnosis, and the broad principles of preventive medicine.

The editors mention one point that is apparent to us perhaps more than to our colleagues—prevention of disease is not so simple as it used to look. This is an admission that many might take to heart. Prophylaxis applies to predisposing rather than to exciting causes, and the reader is more particularly referred to articles on rheumatism and the common cold—called the unromantic sections of the front. The editors refer to the improved attention now given to methods of diagnosis, but sound a note of warning against those which have an element of danger in them; there can be no excuse, in their opinion, for endangering a patient's life when a diagnosis can be made by simpler means, and they are resolved that the influence of the Annual shall be exerted in the direction of sanity. In this they will have the opinion of the profession behind them. 1925 does not appear to be an outstanding year in the annals of medicine, yet several fresh successes in the treatment of disease have been registered. The Medical Annual provides an admirable study of the work done last year and will be as popular as ever.

To R.A.M.C. officers, one point of interest is the extent to which the Corps and this Journal have contributed scientific and professional matter of sufficient importance to find entry into the columns of the Medical Annual. This year we find under Schistosomiasis references to the work of B. H. H. Spence, W. H. Dye and A. H. Hall; in the section on Amœbiasis there is reference to R. S. Townsend's contribution on Tropical Abscess of the Liver; also G. Stuart's observations on the incidence of Typhus Fever in Palestine (October, 1924) is included under that disease; and the case of Epithelioma Adenoides Cysticum described in this Journal (March, 1925) by H. M. Perry and F. C. Doble is recorded and illustrated.

M. B. H. R.

Correspondence.

No. 3 GENERAL HOSPITAL.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

DEAR SIR,—May I offer a slight amendment to a statement in Colonel Clark's interesting note on No. 3 General Hospital, B.E.F., in the April number of the Journal?

No. 3, on moving up to the Rhine, first took over a German sanatorium at Roderbirken, near Leichlingen, where it remained until the winter of 1919, when in November-December it was moved down the hill to the Asylum at Langenfeld.

I am, etc.,

T. H. SCOTT,
Major (local Lt.-Col.) R.A.M.C.
(late O.C. No. 3 G.H.).

Army Headquarters, India,
Medical Directorate.
May 6, 1926.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Any demand for *reprints, additional to the above*, or for excerpts must be forwarded at the time of submission of the article for publication.

Notices of Births, Marriages, and Deaths are inserted in the *Corps News*, free of charge to subscribers. All communications should be written upon one side of the paper only; they should by preference be typewritten; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS." War Office, Whitehall, S.W.1.

The Committee has sanctioned the publication of correspondence on matters of interest to the Corps, and of articles of a non-scientific character under a nom-de-plume. These communications must, however, be approved by the Editor before publication.

MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription is £1 (which includes postage), payable in advance. Single copies, 2s. per copy.

All subscribers to the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, whose annual subscription is paid direct to the Manager of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, will receive monthly a copy of the *Corps News*.

The *Corps News*, separate from the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, can be subscribed for at the rate of 4s. per annum, including postage, payable in advance.

Subscriptions for the *Corps News* separate from the Journal cannot be accepted from Officers on the Active List unless they are also subscribing to the Journal.

The *Corps News* is not on public sale, but obtainable only from the Manager, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS.

Cheques or Postal Orders should be made payable to the "Manager, Journal R.A.M.C." and crossed "Holt & Co."

All communications should be addressed to THE MANAGER, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," A.M.D.2, WAR OFFICE, WHITEHALL, S.W. 1.

Remineralization

of the System, following infection or shock, is one of the fundamental axioms of therapeutics.

Compound Syrup of Hypophosphites "FELLOWS"

contains chemical foods in the form of mineral salts and dynamic synergists in an assimilable and palatable compound, and has established its reputation as the *Standard Tonic* for over half a century.

Samples and literature on request

Fellows Medical Manufacturing Co., Inc.

26 Christopher Street **New York City, U. S. A.**

VALENTINE'S MEAT - JUICE

"For a Tired Stomach."

In **Dyspepsia, Catarrh** of the **Stomach** or **Intestines,** or **Gastric Irritability** from any cause, when the **Digestive Organs** reject milk and other foods, **Valentine's Meat-Juice** will be **Retained** and Demonstrate its Power to **Restore** and **Strengthen.**

It is in constant use in Hospital and Private Practice and endorsed by eminent medical men.

Physicians are invited to send for Clinical Reports.

For sale by European and American Chemists and Druggists.

VALENTINE'S MEAT-JUICE CO., Richmond, Virginia, U. S. A.

CB 92

No. 2. August, 1926. Vol. XLVII.

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

BREVET-COLONEL A. E. HAMERTON, C.M.G., D.S.O., R.A.M.C.

ISSUED MONTHLY

Printed and Published by
JOHN BALE, SONS & DANIELSSON, LTD.
83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

Price Two Shillings net.

VOL. XLVII. AUGUST, 1926. No. 2.

Journal of the Royal Army Medical Corps.

Original Communications.

STUDIES IN MOSQUITO BIONOMICS.

By Major C. H. H. HAROLD.
Royal Army Medical Corps.

It was prior to 1882 that Grant Allen, when recounting Dr. McCook's studies of honey ants in Colorado, placed entomologists in two classes—to quote his own words—" one kind, now, let us hope, rapidly verging to extinction, sticks a pin through his specimens, mounts them in a cabinet, gives them systematic names, and then considers he has performed the whole duty of man and a naturalist; the other kind, now, let us hope, growing more usual every day, goes afield to watch the very life of the creatures themselves at home, and tries to learn their habits and customs in their own native haunts."

The Army School of Hygiene, at Aldershot, is favourably situated from this point of view, being sited in a mosquito belt which extends from Ash to Fleet, and in this area it is possible to collect the majority of species. For breeding room and demonstration purposes in winter, the hibernating *Theobaldia annulata* and *Anopheles maculipennis* are the mainstays. In this district they are found in stables, rarely in cowsheds, and practically never in association with man. In Sandwich district collections are chiefly drawn from cow-sheds and pig-styes. Both are frequently found in the same stable, *T. annulata* in some dark corner and *A. maculipennis* resting on cobwebs. Here surrounded by the warm exhalations of the beasts they remain throughout the winter.

Occasional use is also made of *Culex pipiens* which is collected in damp situations, dug-outs, boiler houses, cellars and the like. It seems to conform more truly to our ideas of hibernation, seeing that it remains practically without movement for days together, does not search for blood, and in all probability subsists upon the store of nourishment contained in an enlarged fat body.

These three adults can be induced to oviposit in the warm breeding room under the stimulus of banana and blood feeds. They all readily avail themselves of the presence of the rabbit, *T. annulata* and *A. maculipennis* literally gorging themselves, but *C. pipiens* is a more temperate feeder. The former are usually immobilized after a feed, but the latter is particularly active and may only show a slight staining of the abdomen. The eggs hatch out and the larvæ are raised under laboratory conditions. These arrangements ensure a supply of adult specimens, anopheline eggs, egg rafts, and large numbers of developing larvæ for demonstration purposes.

In regard to the habits of adult *A. maculipennis* and *T. annulata*. In the summer both show marked zoophylic tendencies. The improved brightness and ventilation of present-day barracks may also contribute to this end, but they are often to be found in a particular group of stables where the whitewash is spotless and the ventilation above reproach. They regularly invade barrack rooms and houses, but in the case of grooms' quarters over stables, even if the ventilation of these is not ideal, the majority will be found in the stables below and very few in the quarters overhead.

Grooms living alongside their horses have also frequently stated that as a rule they are only bitten when grooming the horses in the stables.

Certain residents in the district have also remarked that the mosquito nuisance is greater now than in pre-war times. Undoubtedly the psychological effect of articles in the daily press may tend to foster this opinion, but although the War Department land is not being brought under cultivation or used extensively for building purposes, it must not be assumed that details affecting the amelioration of drainage are being neglected. During the last two years considerable progress has been made in this respect and a marked reduction in breeding places has automatically taken place. In this connexion the present-day decrease of the equine garrison should not be overlooked.

The bite of *T. annulata* usually gives rise to severe reaction, occasionally septic infection accompanied by marked ecchymosis. The bite of *A. maculipennis* is of the same type but less severe in character. During the winter both insects feed readily during the day, *T. annulata* being the more constant day feeder. At 4 p.m. during a spell of bright sunshine in March, 1925, one of our men at work near a spinney was surrounded by hundreds of freely biting *T. annulata*.

There is no doubt that certain people are more attractive to mosquitoes than others, and a count of the bag after forays in the woods has revealed that three times as many mosquitoes may be caught on one person as on another. This quality is more usually possessed by the fair, and one particular serjeant was frequently referred to as "the bait."

The home service khaki with its greenish shade is favoured by sylvan species, but whereas they appear to distrust the smoother cloth of the

officer, they readily settle on the rough and stubbly surface of the man's serge. This predilection becomes more noticeable in the breeding room, where mosquitoes generally ignore the shaven back of the rabbit and settle on its nose with alacrity.

On more than one occasion with *A. maculipennis* on the wing and despite the presence of several people, a dog has been singled out, and again the point of attack was the muzzle. This type of surface may be warmer and associated with a superior blood-supply, and as the mosquito usually makes a careful selection of the site of bite and has a particular affinity for babes, in like manner the texture of the skin of a fair person may present greater attractions.

An actively sweating man is not particularly attractive, but during the period of cooling off after exercise a heated man is more likely to suffer from the attentions of these insects than a cool one. This is in keeping with Howlett's observations on the effect of heated surfaces, in his case test-tubes. Another somewhat curious fact has been noticed, that, in the absence of blood, mosquitoes will occasionally gorge themselves with milk, even if water is available.

Although *A. maculipennis* seems to pass the winter solely in the adult stage, with nearly every winter collection of larvæ *T. annulata* appears.

As regards breeding places in this district, both *A. maculipennis* and *T. annulata* are to be found in foul water and frequently together. *T. annulata* selects the worst type and has been recovered from drains taking washings from stables and middens. One of the most constant breeding places of *A. maculipennis* is in a roadside ditch at Ash, the end of which has been used as a rubbish tip for years. After the winter rains this drain under a hawthorn hedge is converted into a fairly large expanse of water. In the early summer, amongst the coarse grass along the edge *A. maculipennis* larvæ are found in enormous numbers, and towards the centre, where the water is more impure, *T. annulata* can be seen.

Though normally the Basingstoke canal proper can be explored for days with negative results, *A. maculipennis* is to be found in its weedy and boggy offshoots. With the advance of summer these, the normal breeding places, dry up and the contained water becomes extremely foul. The larvæ of *T. annulata* persists in these situations until the end, but *A. maculipennis* now takes to breeding in the relatively clear water of the canal. From this it will be seen that the above species frequently do select water which is more impure than some sewage effluents. Details regarding the pH of these will be discussed later.

There is some evidence that the larva of *T. annulata* pupates and emerges during the winter, and on rare occasions a male adult which has a short span of life has been collected.

During the late autumn use is made of *C. pipiens* obtained in the vicinity of Camp Farm sewage works, but as a general rule collections of *T. annulata* and *Theobaldia morsitans* are made and occasionally *Aëdes*

punctor is available. *T. morsitans* is normally found near Mytchett flash in old trenches filled with leaves and also in the overflow from the lake. The water in these places approximates to the acid type favoured by the majority of sylvan mosquitoes, but at the same time *T. morsitans* does not avoid impure water. An unusual association with *Anopheles bifurcatus* in the alkaline foul water of an overgrown roadside channel receiving washings from a country road covered with cow droppings is noteworthy, and it has also been collected in company with *T. annulata* and *A. bifurcatus* in a slightly acid water resulting from washouts from certain dykes.

Anopheline Larvæ (Winter).

The only species available is *A. bifurcatus* which in Palestine selects the cool and clean water of wells. In Aldershot it has been regularly collected in large numbers in old sewage runnels at Camp Farm sewage works and in stagnant and evil-smelling water of roadside dykes in Ash district. It also resorts to breeding places frequented by *A. maculipennis* during the summer, though the impurity of the water in these is materially reduced by the winter rains. In none of these situations can it be said to be breeding in relatively clean water or in woodland country. The majority of the larvæ are in the 3rd instar, although collections made in February and December, 1925, included at least twenty-five per cent. of 2nd instar larvæ.

During the winter, 1925-26, a particular marshy area in Ash yielded large numbers of this species in company with *T. morsitans,* and the water possessed a definitely acid reaction.

Owing to the preponderance of *A. maculipennis* larvæ the summer breeding places of *A. bifurcatus* have not been identified, but as the majority of the winter breeding places are dry until autumn, alternative breeding places must be common.

In the late spring the adult mosquito is frequently found in houses in Ash district. It apparently enters these for shelter, and complaints as regards biting are unusual. During the summer it is rarely found indoors, and stables which abound with *A. maculipennis* occasionally yield an odd one. It will readily attack man in the breeding room, and has been caught in the woods in early summer in the act of biting. The same has been noted with *Anopheles plumbeus,* which is very infrequently met in this district. The bite of *A. bifurcatus* gives rise to little irritation and reaction. In early spring it is quite a common occurrence for the male to accompany the female indoors, whereas in the case of *A. maculipennis* this condition only obtains with the very early broods, and later in the year only here and there a male is encountered.

Culicine Larvæ (Spring).

Collections can be made within 200 yards of the school under the trees and low bushes shading the weedy offshoots and numerous depressions along the banks of the Basingstoke canal, and during the last three winters

these places have been subjected to a close scrutiny. In these situations the water becomes acid in type in the presence of decomposing leaves, and *T. morsitans* is commonly located, followed as a rule by broods of *A. punctor*.

In the winters of 1923-24 and 1924-25 *A. punctor* larvæ were not found, although they subsequently bred out in the spring; but in 1925-26 both *A. punctor* and *T. morsitans* were found in association throughout the winter. Up to date one brood of *A. punctor* has only been noted in the course of the year, and this is in agreement with the observations made by Dr. H. G. Dyer in North America. It can hardly be pleaded that this condition is due to drought, particularly in the case of the summer 1925, and also in order to induce second broods, some of the breeding places were kept filled with water from the canal during such periods, and still no second brood resulted. In this connexion no information is available regarding the time that *A. punctor* ova take to reach maturity, and as the canal water is alkaline in the summer, it may lack a very necessary stimulus which an acid water imparts. On one occasion, when a second brood was suspected, it was finally decided that it was a delayed first brood, and that the breeding place was one which had not been filled with water since the previous spring owing to improved drainage of the area.

At Puckridge Hill a record of collections has been kept, and from one small sylvan pool during the winter and early spring the following succession of larvæ has been obtained: *T. morsitans*, *A. punctor*, *Aëdes annulipes*, *Aëdes cinereus*, *Aëdes geniculatus*, and *Aëdes rusticus*.

I am informed by F. W. Edwards, Esq., that he has never encountered *A. annulipes* in such a situation, and that it usually breeds among rushes.

It is of interest to record that *A. geniculatus*, normally a tree-hole breeder often found in company with *A. plumbeus*, has in the course of the last three seasons been found in association with *A. cinereus*, a river-haunting mosquito, and also with several other species of sylvan larvæ in a pool of water in the ground; while, on the banks of the same pool, adult *Aëdes maculatus*, *A. punctor*, *A. annulipes*, *A. rusticus*, and *A. geniculatus* have been caught in fair numbers.

In the spring of 1925 a collection of larvæ made from one of the offshoots of the canal occluded by yellow iris proved to be *A. punctor* and *A. cinereus*, and the water possessed a definitely alkaline reaction.

The warm evenings of early summer in Aldershot and district are frequently rendered unbearable by the attack of adults of the *Aëdes* series, and although the bites do not result in severe lesions, they have a peculiarly irritating character. *A. cinereus* does not appear to be strongly attracted to man, and is collected with difficulty, its bright chestnut colouring making it conspicuous when on the wing. The other members of the series bite freely throughout the day under the shade of the trees, and are especially active between the hours of 6 and 8 p.m.

It has been stated that, with the exception of *Aëdes caspius*, these

mosquitoes do not enter houses, but *A. punctor* has frequently been observed biting indoors, and on one occasion *A. annulipes* was collected in the act of biting a member of my household standing directly under a twenty candle-power electric light.

It has been generally observed that *A. maculipennis*, *T. annulata*, and even on occasions *A. bifurcatus*, make more or less open attacks during the evening indoors, gorge themselves with blood, and are discovered next day on the walls and ceilings. On the other hand, the *Aëdes* series are more difficult to detect, and usually make their attacks under cover of darkness or beneath chairs and tables. They then leave the rooms and make for their haunts in the woods, and this accounts for the difficulty in procuring naturally fed specimens.

It is frequently stated that adult *C. pipiens* may give rise to complaints. The annexes of the majority of houses and barracks in this district harbour these insects in considerable numbers during the winter, and even in the spring prior to sallying forth they are generally regarded as a non-biting species. If numbers of *C. pipiens* are examined it is a rarity to find a specimen showing evidence of recent blood feeds, and in common with sylvan species of mosquito when fed it appears to spend its time outdoors.

On rare occasions this species has been caught in the act of biting, but many of the mosquitoes captured during the evening indoors, which at first sight were thought to be *C. pipiens*, have proved on further examination to be *A. punctor*. The hibernating *C. pipiens*, when brought into the breeding room, will take frequent small feeds from the rabbit and is easily induced to oviposit, and therefore for class purposes is useful.

In regard to breeding places, most collections of water serve and particularly water-butts and the like which contain the decomposing debris from gutters, etc. These waters are alkaline in character, and up to the present larvæ of *C. pipiens* outside the laboratory have never been taken from an acid type of water. In the laboratory *C. pipiens*, in the absence of other facilities, will oviposit in acid types of water containing natural silt, and although the eggs hatch the larvæ fail to grow and gradually die off.

Feeding Habits.—The question arises as to whether in common with other insects and animals a relationship may not exist between the siting of breeding places and the feeding grounds. The most constant breeding pools of *A. maculipennis* are within easy flight of stables, but in times of drought the canal and other unusual situations are utilized. Our most dependable breeding places of *A. bifurcatus* are within easy range of cowsheds or fields with cows in pasture.

The *Aëdes* series, as mentioned previously, favour sylvan pools, but here again the most favoured spots are in the immediate vicinity of bathing places, i.e., Mytchett and No. 2 bathing place, and bathing and boating parties suffer severely from their attentions. At the same time it is impossible to rule out of court the natural denizens, birds, rabbits, stoats and foxes, etc., with which these woods abound.

Precipitin Reaction of Mosquitoes.

It was thought that the results of these might afford useful supplementary information regarding the propensities of the various species, and antisera were prepared as follows :—

(1) Horse *v.* rabbit.
(2) Man *v.* rabbit.
(3) Rabbit *v.* fowl.
(4) Pigeon *v.* rabbit.

(1) In this case the rabbit received six intraperitoneal injections of from five to ten cubic centimetres of horse-serum, and the rabbit bled between the eighteenth and twenty-first day.

(2) As in (1), using human-serum.

(3) Whole citrated blood of the rabbit administered intravenously in accordance with Sutherland's methods.

(4) As in (1), using whole citrated blood of the pigeon.

Sutherland's technique was also adopted for the performance of the reactions.

In this respect the field of examination is unfortunately incomplete, because in spite of prolonged searches naturally fed sylvan culicine mosquitoes were not encountered. It would of course have been an easy matter to collect these off one of my own staff sitting out in the woods or to have fed them artificially off man or rabbit in the breeding room. This also applies to *A. bifurcatus*, but at the same time both *A. bifurcatus* and *A. plumbeus* have been collected attempting to bite during the day under the shade of the trees.

In the case of certain specimens a little difficulty was experienced in reading the results, owing to the fact that the mosquito extract was opalescent. This condition was readily amenable to centrifugalization or sedimentation after trituration.

The only naturally fed mosquitoes available were *A. maculipennis*, *T. annulata* and *C. pipiens*, in other words, the domestic species, but although the readings of the reactions give useful and interesting indications, the number carried is far too small upon which to base any final opinion.

C. pipiens.—Over twenty specimens collected around barracks showing no signs of blood feeds were examined, and they gave entirely negative results. Those showing signs of definite blood feeds gave the following reactions : Human, strongly positive, one. Rabbit, strongly positive, one—positive, one; trace, one. Six specimens did not react with any of the type sera.

In the light of laboratory experiences the rabbit reactions are of interest. The number of negatives indicates that the variety of type sera used should be increased.

T. annulata.—Some were collected in houses and others in stables, and

only those with definite signs of blood feeds were submitted to examination. Human, strongly positive, one; positive, two; trace, one. Horse, strongly positive, two; positive, three. Rabbit, positive, one. Pigeon, strongly positive, two—one of these also gave a trace of reaction with human antiserum.

This species in captivity attacks the rabbit with avidity.

A. maculipennis.—Collected in houses and also in stables; well-fed specimens were selected at random.

(1) Mr. Shute's collection from stables :—

Human, positive, three. Horse, positive, two. Rabbit, positive, one.

A number of specimens known to have fed on man gave definite human reactions and are not included.

(2) Aldershot collection :—

Human, positive, ten ; trace, two. Horse, positive, seven; trace, two. Rabbit, positive, two; trace, three. Pigeon, positive, one. Human positives gave trace reactions with horse, two; rabbit, one. Horse positives gave trace, two human; and trace, two rabbit—one specimen gave positive horse, and trace human and rabbit.

These results indicate that these mosquitoes are somewhat catholic in their tastes. The majority were collected in a district which abounds in wild life, although there also exists a large preponderance of human beings over domestic animals. In the case of double reactions it is possible that one or other of these may be non-specific, but the small amount of fluid available did not permit of the putting up of additional tubes, as is suggested by Sutherland.

The Hydrogen-ion Concentration of Waters.

For some time past evidence has been accruing under the artificial conditions imposed by the breeding room pointing to the fact that this is a matter of minor importance to the developing larva and that the prime factor is food. This view was expressed during a visit paid by Dr. A. Balfour to the school three winters ago, and as a direct outcome systematic outdoor observations have been carried out during the last two years. A series of experiments in this connexion were also carried out in the laboratory in March, 1925.

Captive *A. maculipennis* can be readily induced to oviposit in water with a low pH and healthy young larvæ result. If to the water crushed *Myosotis palustris* is added in suitable quantities, a mild septic action is set up leading to an opalescent coloration of the water, the larvæ grow to perfection, the weed is slowly lysed and an increase in the pH of the water occurs.

If no further attention is paid to the tank the contained water becomes blackish, develops a higher pH value and nitrites appear. This condition is not wholely suited to the development of the larva, but if further additions

of weed are made and the mild septic action maintained the tank can be successfully employed for some weeks. Eventually a point is reached where the water becomes black, very offensive, the larvæ do not thrive in it and it becomes necessary to discontinue using it. A new tank is best started by seeding into the fresh water a little of the black water from a discarded one. The addition of an excess of weed at any time induces a marked septic action accompanied by a heavy scum formation which brings about the death of the larvæ.

It should be noted that the above adverse conditions appear comparable with the state of affairs which arise in the natural anopheline breeding places during times of heat and drought, and it is possible that in tropical and sub-tropical regions there may be a connexion between the rapid development of septic action and the selection of cleaner types of water.

Having regard to the biological action occurring in waters and sewages, apart from the presence of protozoal and algal life, the breaking down of colloid, production of ammonia and nitrification are also dependant upon the contained bacterial flora, and superficially the conditions conducive to optimum growth of the anopheline larva in the laboratory and the changes occurring in certain natural waters appear to be similar.

Rudolphs, who is a strong advocate of the importance of food, lays great stress upon the presence of protozoal life and mentions the presence of aquatic fauna such as cyclops in some of the water samples examined by him.

It must be admitted that the presence of daphnia and cyclops is indicative of the availability of food, but in many instances it has been observed that waters containing cyclops are not conducive to optimum growth.

During the last two years mosquito larvæ have been taken from water with the following ranges of pH :—

		Remarks
A. annulipes, *A. maculatus*, *A. geniculata*, *A. rusticus*	4·7 to 4·9	—
A. punctor and *A. cinereus*	4·4, 6·6 to 7·5	Almost invariably the lower ranges
T. morsitans	4·4, 6·0 to 7·4	Normally the lower ranges
A. bifurcatus	6·0, 7·2 to 7·8	Normally the higher ranges
A. maculipennis	6·8 to 7·8	—
T. annulata	6·0, 6·8 to 8·0	Has never been recovered from typical sylvan acid water

Gases in Solution.—In this district typical *A. bifurcatus* and *A. maculipennis* waters give a dissolved oxygen figure of 0·517 to 0·876 parts per 100,000, and during times of drought this is still further reduced. Sylvan waters (*Aëdes* and *Theobaldia morsitans*) have a dissolved oxygen figure of 0·814 to 0·870 and a CO_2 figure of 3·9 to 6·0 parts per 100,000.

The above anopheline waters have a CO_2 content of from 0·25 to 1·1 parts per 100,000, and up to the present time larvæ have not been recovered from waters containing CO_2 in excess of 1·8 parts per 100,000.

If normal *A. bifurcatus* and *Aëdes* waters are supercharged with CO_2

in a Sparklet bottle and the larvæ returned to their respective waters, both become moribund, but the recovery of *A. punctor* is much more rapid than *A. bifurcatus*. *A. punctor* is normal and markedly active on the following day, but *A. bifurcatus* is still lethargic and does not readily respond to direct stimulation.

The Feeding Larvæ.—*A. bifurcatus* in Aldershot is frequently found in a brownish or greenish-tinged water with a slightly offensive odour containing much matter in suspension. In such water the larva spends the major portion of the day feeding at ease on the surface. Not so the *Aëdes* series which select the clear water of pools lined with rotting leaves and twigs, from which a light red deposit separates out on standing. Under these conditions they spend long periods cruising about below the surface rubbing their mouth-parts along the rootlets and submerged plants and weeds.

In common with certain other species, the *A. punctor* larva with its long retractile gills in a water containing little colloid, etc., in suspension, is anatomically adapted for long periods of submersion. In the case of the anopheline larva the gills are papilliform, more or less rudimentary, and the water selected by them often contains low percentages of dissolved oxygen, e.g., some of the samples are virtually sewage effluent. Hence, it would appear that the anopheline larva may be largely dependant upon food in suspension.

The following simple experiments were performed in order to discover if any evidence could be adduced in support of these views :—

Experiment I.

Samples of water were taken from a typical *Aëdes* breeding place in an unfrequented part of the wood, and also from one of our usual *A. bifurcatus* breeding places. The *Aëdes* sample had a pH of 4·9, and the *A. bifurcatus* a pH of 7·5. On plating on gelatine it was seen that the *A. bifurcatus* water yielded at least five times as many colonies as the *Aëdes* water, and that the majority of organisms in the anopheline water were liquefactors of gelatine and gave rise to putrefactive odours.

The appearance of the litmus lactose agar plates was still more striking; with 0·5 and 0·1 of a cubic centimetre of *A. bifurcatus* water the plate was covered with an innumerable mass of colonies, many of these being lactose fermenters, whereas plates from the *Aëdes* water showed two bacterial colonies only and a single mould which rapidly obscured the plate.

Further platings with the acid type of water :—

1 c.c.	..	..	1 red colony (Gram + coccus)
0·5 ,,	..	..	3 mould colonies

After stirring up the bottom of the pool :—

1 c.c.	..	..	Extensive growth of Gram-negative bacillus
0·5 ,,	..	..	No growth

It has also been noted, in this *Aëdes* favoured district, that many of the typical acid type waters do not contain beech leaves, and that moulds and fungi are a frequent source of trouble when carrying out platings and experiments in connexion with water purification. The water supply of the school, a local surface water, has a pH frequently lower than 5·6, and a ferruginous growth and deposit in the pipes has recently necessitated the relaying of new mains. The fact that a reddish deposit separates out from our normal *Aëdes* water has already been commented on, and the association of moulds and fungi in nature with other organic acids such as oxalic, succinic and citric, is of interest.

Experiment II.

In continuation of the above collections of *A. punctor* and *A. bifurcatus*, larvæ were made and carefully removed from their native medium into beakers by means of a ball pipette. The residual water was drained off and the beakers filled up with ordinary tap water. From the natural breeding places the following samples of water were obtained after well stirring up the silt.

A normal *A. punctor* water with a pH of 4·9, an abnormal one with a pH of 7·2, and an *A. bifurcatus* water with a pH of 7·3. Representative groups of larvæ were then placed in dissimilar waters, and also in their natural waters as a control. The vessels were placed in the warm breeding room, and a good layer of silt and debris separated out on standing.

The experiment commenced on May 6, 1925, and on May 22, 1925, the condition was as follows :—

(1) In the *Aëdes* control water pH 4·9, fifteen dead *Aëdes* larvæ, others emerged.

(2) *Aëdes* in anopheline water, no deaths, all emerged.

(3) Anophelines in abnormal *Aëdes* water pH 7·2, no deaths, one pupa, six larvæ of poor size, others emerged.

(4) Anopheline control, six healthy larvæ remained, three deaths, others emerged.

(5) Anophelines in normal *Aëdes* water pH 4·9, two larvæ remaining, seven deaths, poor specimens emerged.

On June 2, 1925 :—

(3) Three larvæ remaining, others emerged—all emerged eventually.

(4) One larva remaining, others emerged—eventually all emerged but development was delayed.

(5) All emerged.

The *A. punctor* larvæ were in various instars, and the majority of the *A. bifurcatus* larvæ were in the 3rd instar. The effect of the anopheline water upon *A. punctor* was striking ; within forty-eight hours sixteen had pupated and the others had attained a good size and were very active. They spent less time below the surface of the water and in every way

outstripped their brethren in their native medium. The emerging adults were also larger than those from the control water.

As regards *A. bifurcatus*, they did not fare so well; it would appear that they mature more slowly than *A. punctor*, and although no deaths occurred in the abnormal *Aëdes* water with a pH of 7·2 they did better in their own type of water. In the normal *Aëdes* water pH 4·9, they spent longer periods amidst the debris at the bottom of the vessels and the emerging adults were weedy and similar in appearance to those raised in waters with a deficient food content. If anything the effect of the acid type of water seemed to cause the larvæ to develop a little more rapidly than in the control.

On other occasions abnormal conditions have exercised effects which at first sight appear anomalous and do not readily admit of explanation, e.g., larvæ transferred to unsuitable waters may either remain in the same stage for very long periods and exhibit a low mortality, or the cycle of development may be appreciably shortened, a heavy mortality may ensue and very poor specimens emerge. The exact line which is followed seems to depend largely upon the instar of the larvæ. If they are transferred in the 1st or early 2nd instar the first course is the more usual, but if in more advanced stages the 2nd is more commonly observed. Mosquito larvæ bred in stale water in which septic action has subsided have a cycle of development which is extremely prolonged. They are very tenacious of life and *A. bifurcatus* larvæ under such conditions, when exposed to higher temperature in the breeding room, have been known to remain in the larval stage for weeks and eventually inferior specimens have bred out. In many instances the transference of well-developed larvæ to a different type of water leads to an acceleration in development culminating in rapid pupation, and this response may be regarded as a defensive measure. If the water does not abound in suitable nourishment the curtailment in development is reflected in the inferior physique of the emergent mosquitoes.

On conclusion of the experiment the pH values of the waters were :—

Normal *Aëdes* water, original pH 4·9 (control); pH 4·7. Note increased acidity.

Normal *Aëdes* water pH 4·9, containing *A. bifurcatus*; pH 4·7. Note increased acidity.

Abnormal *Aëdes* water pH 7·2, containing *A. bifurcatus*; pH 7·8. Note increased alkalinity.

Normal *A. bifurcatus* water pH 7·3 (control); pH 7·8. Note increased alkalinity.

A. bifurcatus water containing *A. punctor*, pH 7·3; pH 7·8. Note alkalinity.

Note.—Typical acid type water becomes increasingly acid and typical anopheline water more alkaline.

The above seems to afford support to the view that as far as the growth of larvæ is concerned the important factor is food.

Experiment III.

As an elaboration of the foregoing, *A. bifurcatus* larvæ collected from the usual sources were transferred to tap water with a pH 5·6. In this they remained in a sluggish condition without undergoing further development for fourteen days.

Mixed agar cultures of organisms isolated from *A. bifurcatus* water were emulsified and added to tap water which became opalescent and caused its pH to be raised to 7·6. The pH of the water was now readjusted with acetic acid to its original pH of 5·6 and the larvæ transferred to the enriched medium. At the end of three days at breeding room temperature all larvæ were lively and well and three had pupated.[1] At the end of eight days one had died, the rest had emerged and all adults were of good size. On conclusion of the experiment the reaction of the water had reverted and indicated a pH of 7·6.

Experiment IV.

A further experiment was carried out with *A. punctor* larvæ. In the previous experiment it is noted that in tap water pH 5·6, *A. bifurcatus* did not grow or develop within fourteen days.

A. punctor larvæ placed in this water all emerged within twelve days but were poor specimens.

Aëdes detritus, a salt marsh species, is not found in this district, but *A. punctor* larvæ placed in tap-water pH 5·6, which included silt from a normal *Aëdes* breeding place and an addition of 0·3 per cent NaCl, grew apace, were vigorous specimens and bred out within twelve days. In the same water, containing 0·3 per cent NaCl but excluding debris, the larvæ died one by one and all developed cannibalism and could be seen running their mouth brushes around the bodies of their dear departed. The last larva, a worthy successor of the hero of the "Nancy Brig," died on the twenty-first day, having attained a good size and being in the 4th instar.

It is difficult to provide a satisfactory interpretation of the above. It is known that this particular water gives a high total colony count and apparently the food content is sufficient to sustain life and permit of development. In the presence of excess food (silt) the larvæ thrived, and the question arises whether the fatal results are due to deleterious effect of salt upon larvæ subsisting upon a minimum of food, or whether in the case of this particular water food factors other than bacteria hold the field and these are inimically affected by the abnormal inclusion of salt.

It may be urged that if in Experiment III the transference of larvæ had been delayed they would have eventually developed. This is partially true; a few of this species have been known to survive in this water and after

---

[1] Note.—We are now using this simple and very satisfactory method for the maintenance of stocks of *A. bifurcatus* larvæ for winter demonstrations, but no readjustment of water is made.

delay emerge, but at the same time the response to the beneficent change of environment is too sudden and complete to permit of an alternative interpretation. As a general rule it may be deduced that the *A. punctor* larva develops more rapidly than *A. bifurcatus*, that it is capable of development in the presence of a smaller quantity of bacterial life, and that *A. bifurcatus* can subsist for a longer period without undergoing development, awaiting the advent of more favourable conditions.

Although the above experiments appear reasonable particular attention should be paid to the time of year when they were performed. In mid-winter the response to warmth and suitable food in the breeding room is normally more noticeable in the case of the artificially reared *A. maculipennis* larva than with the imported *A. bifurcatus*. In late winter *A. bifurcatus* outstrips *T. morsitans* and *A. punctor*, but in the spring the positions are reversed.

The impression has therefore been gained that there are other latent agencies at work, and notably an inherent seasonal influence acting in conjunction with certain food factors.

While admitting that the evidence in support is meagre, that the objections to these views are numerous and particularly that they are based on observations made under purely artificial conditions, still on further investigation they may prove very difficult to entirely refute.

(*To be continued.*)

A WESTERN COMMAND R.A.M.C. STAFF TOUR.

By Colonel H. ENSOR, C.B., C.M.G., D.S.O.

(*Continued from page* 54.)

Task No. 1.

(1) The 1st Division is to march on Shrewsbury in two columns as detailed in Narrative No. 1. State as A.D.M.S., 1st Division, what recommendations you would make to the staff with regard to the march of the field ambulances and sanitary section. It is to be assumed that the advanced guard of each of the two columns of the 1st Division will comprise one infantry battalion.

(2) What recommendations, also, would you make as to the march of the motor transport of the field ambulances?

Task No. 2.

Supply Railhead is at Builth, and the refilling point for the 1st Division is at the road junction at C. 3411; time for refilling is 17.00 hours, January 7. State how Nos. 7, 8 and 142 Field Ambulances and 1st Divisional Sanitary Section will obtain their rations for January 8.

Task No. 3.

The 1st Division is on the night, January 8/9, billeted in the areas given in Narrative No. 2.

State what arrangements would be made for the evacuation of sick and casual wounded to the casualty clearing station at Knighton.

Task No. 4.

In Narrative No. 3 it is stated that as a result of the advanced guard of the right column meeting with opposition from enemy cavalry at Micklewood and Longnor it sustained the following casualties:—

Killed ..	2	Wounded ...	8

State what action you would take with regard to the wounded.

Task No. 5.

At 18.00 hours, January 9, the A.D.M.S., 1st Division, receives a message from D.D.M.S., 1st Corps, to the effect that four cases of small-pox have been diagnosed among the troops (reservists) of the 1st Division. Two cases from "F" Battalion and two from "H" Battalion, 2nd Infantry Brigade. State what action should be taken.

Solution of Task No. 1.

(1) The A.D.M.S. should recommend that No. 7 Field Ambulance should be detailed for duty with the left column, and Nos. 8 and 142 Field Ambulances to the right column.

It is also recommended that one company of No. 7 Field Ambulance should march in rear of the advanced guard of the left column, and that the remainder of the Field Ambulance, less its motor transport, should march in rear of this column.

With regard to the right column:—

It should be recommended that No. 8 Field Ambulance, less motor transport, should march in rear of the leading infantry brigade of this column with one of its companies in rear of the advanced guard.

No. 142 Field Ambulance, less motor transport, should march as a complete unit in rear of the troops of the right column. It should be impressed on the staff by the A.D.M.S. that the above arrangement is absolutely necessary if wounded from the advanced guards are to get prompt medical assistance. In the event of an advanced guard meeting with resistance and being forced to deploy to overcome it, the O.C. company of the Field Ambulance with it will be in a position to select and open an advanced dressing station at the earliest possible moment—a matter of the first importance so far as the welfare of the wounded is concerned. It should not be forgotten that the resistance met with by the advanced guard may be so serious that it may be necessary to deploy and to bring into action one or more of the remaining battalions of the leading infantry brigade.

The Divisional Sanitary Section is not required when a division is on the line of march and contact with the enemy is possible. The duties peculiar to it cannot be carried out under such circumstances. The A.D.M.S. should recommend that this unit should march with the Divisional Train; its motor transport with No. 1 M.T. Company, and its personnel with No. 3 H.T. Company.

In the event of the Divisional Staff agreeing to these recommendations, the A.D.M.S. should send orders for the field ambulances to march as follows:—

No. 7 Field Ambulance to the Onibury—Clungunford areas and No. 8 Field Ambulance to the Bromfield—Stanton Lacy areas. The Divisional Sanitary Section should at the same time proceed to the Divisional Train area at Brampton Bryan.

The O.C Divisional Train must also be informed of the change of position of these units so that they may receive their supplies.

(2) It is impossible for the motor transport of the field ambulances to march with their units; their engines cannot stand the low rate of speed. The combined motor transport (less motor cycles) of the field ambulances of a division is as follows:

Motor lorries, 3 ton	3
Motor ambulance cars, light	18
" " " heavy	6

The A.D.M.S. should recommend that the motor transport of the field ambulances allotted to the right column, i.e., two 3-ton lorries, twelve light and four heavy motor ambulance cars should by day march as a convoy under the orders of an officer to be detailed by O.C., No. 142 Field Ambulance. This convoy should march in rear of the column, but in view of the fact that its services may be required at any time, it should be given by the staff precedence over all other mechanical transport. It should advance by "bounds," i.e., after the rearmost unit of the column has marched and two hours have elapsed, it should go forward, get into touch with the rear of the column, and again wait for two hours before making a second bound. When in motion it should move with wide distances between the vehicles, and when halted the vehicles should not be concentrated but should be extended and concealed from hostile aircraft.

At the end of the march, the motors should proceed to join the headquarters of their units for the night, and are, the next day, under orders of the A.D.M.S. to assemble at a place and time given by him. This place would usually be the billeting area of the most advanced of the field ambulances.

The motor transport of No. 7 Field Ambulance with the left column should also march as above detailed.

Solution of Task No. 2.

The divisional M.T. Company (a corps unit) will at some previous time have carried the rations for the 1st Division from the Supply Railhead to the refilling point.

The light supply lorries of the three field ambulances of the 1st Division, and the motor van of the Sanitary Section, march with No. 2 M.T. Company of the Divisional Train, and are in Brampton Bryan area. They will move with the rest of No. 2 M.T. Company in the afternoon to the refilling point where they will be loaded with the rations indented for the previous day on A.B. 55A by the Officers Commanding the Field Ambulances and the Sanitary Section.

The Supply Officer, Divisional Troops, knows in what areas these units are situated and will send their supply vehicle to them in company with the other supply vehicles belonging to units in the same area, Divisional Headquarters will, in the meantime, have selected places called "Meeting Points," in this case one for each of the three areas in which the 1st Division is billeted—Onibury—Blomfield—Ludlow. Officers Commanding Field Ambulances will detail a N.C.O. to proceed to these meeting points to meet the supply vehicle of their unit and to guide it to the place where the unit is billeted. The rations are then unloaded and the empty supply vehicles return to the Headquarters of the Divisional Train, taking

with them indents on A.B. 55A for the rations required to be drawn on the following day.

Solution of Task No. 3.

The A.D.M.S. should issue orders that O.C. No. 142 Field Ambulance at the Hall at Strefford (Y. 9868) should open a dressing station to which all the sick and casual wounded of the right column are to be sent as soon as they have been collected by the motor ambulance transport of Nos. 8 and 142 Field Ambulances after they have rejoined their units at the end of the day's march.

No. 7 Field Ambulance should similarly form a dressing station for the service of the left column.

As soon as Officers Commanding Nos. 7 and 142 Field Ambulances have some idea of the number of lying and sitting cases which will require removal, they should send messages by motor cycle to O.C. No. 1 Motor Ambulance Convoy at Knighton asking that the number of cars they consider will be required to evacuate the cases in their dressing stations to the casualty clearing stations should be sent to them.

No. 1 Motor Ambulance Convoy is a Corps unit and under the orders of the D.D.M.S., 1st Corps, but it may be assumed that he will have given orders to O.C. No. 1 M.A.C. to clear the dressing stations of the divisions in the Corps, and, in consequence, it will not be necessary to apply for motor ambulance cars to clear the dressing stations through D.D.M.S., 1st Corps. It should be a Standing Order that the rearmost field ambulance of a column should, when the division is on the line of march, be responsible for opening a dressing station for the reception of all sick and wounded from the column as soon as this field ambulance has halted for the night.

It must be remembered that inevitably a certain number of men will "go sick" in the early morning before the troops march off. They must be sent to the field ambulances which have opened dressing stations, and evacuated to the casualty clearing station. On this account it will be advantageous for O.C. No. 1 M.A.C. to detail a certain number of his cars to remain the night with the field ambulances to which sick will be transferred in the morning.

It is to be understood that the duty of evacuating sick and wounded from the dressing stations of field ambulances is laid down by Field Service Regulations on the Motor Ambulance Convoys.

Solution of Task No. 4.

The wounded should not be taken a yard further forward than is necessary. They should be accommodated in the nearest house on the main road and remain there with the minimum of R.A.M.C. personnel and

equipment required to look after them. The map location of the wounded should be sent at once to A.D.M.S., who will inform the O.C. Divisional Motor Ambulance Transport of the position of the wounded, and also state to which unit the R.A.M.C. personnel in charge of the wounded belong.

The wounded will then be evacuated to the dressing station, opened by the rearmost field ambulance when the march is over, by the motor ambulance transport of the unit to which the R.A.M.C. personnel belong when it goes forward at the end of the day's match to rejoin its headquarters. R.A.M.C. personnel and equipment are also to rejoin their unit by means of the motor ambulance transport of their unit.

Solution of Task No. 5.

The A.D.M.S., in view of the fact that contact with the enemy has been established, and that an action is almost inevitable on the following day, should inform the Divisional Staff of the message he has received, and recommend that no action be taken until the military situation is less urgent.

SECRET.
Copy No. 14.

1st Division, R.A.M.C., Order No. 1.

Reference O.S. Maps, 1 inch, Sheets 60 and 70.

January 9, 1926.

(1) (*a*) The Division has received orders to attack the enemy to-morrow, January 10. The enemy is holding the line: Longden Manor—Longden—Exfordsgreen—Condover.

(*b*) The 1st Infantry Brigade has orders to capture the line: Longden Manor—Longden—Exfordsgreen (exclusive). The 2nd Infantry Brigade is to capture the line: Exfordsgreen—Condover.

The 3rd Infantry Brigade has received orders to send two battalions to Frodesley to-morrow.

(*c*) The 1st and 2nd Infantry Brigades will advance to the attack at 07.00 hours to-morrow, January 10; the two battalions of the 3rd Infantry Brigade are to march to Frodesley at 04.00 hours to-morrow and are to advance from this place at 06.00 hours to outflank the enemy position at Condover from the East.

(2) (*a*) O.C. No. 7 Field Ambulance will be responsible for the collection of wounded from the Left Column. O.C. No. 8 Field Ambulance will be responsible for this duty with regard to the wounded in the 2nd Infantry Brigade area. O.C. No. 142 Field Ambulance will detail one of his Companies with its complete transport, and one light ambulance car, to accompany the two Battalions of the 3rd Infantry Brigade ordered to outflank Condover.

(*b*) O.C. No. 142 Field Ambulance will form the Main Dressing Station for the Right Column at Church Stretton with his Headquarters. This Main Dressing Station is to be opened for the reception of casualties by 06.00 hours to-morrow, January 10. O.C. No. 142 Field Ambulance will also form a Walking Wounded Collecting Station at All Stretton, and will detail one officer, the nursing personnel, and the cook of his remaining company, to form the Staff of this Collecting Station.

(*c*) O.C. No. 7 Field Ambulance will select a suitable site for the Main Dressing Station for the Left Column and will inform O.C. No. 1 M.A.C. at Horderley (Y. 68) of its position by motor cyclist, and by signal message to A.D.M.S.

(3) The motor ambulance transport of Nos. 8 and 142 Field Ambulances (less three light cars of No. 8 Field Ambulance and one light car of No. 142 Field Ambulance) will be formed into a Divisional Motor Ambulance Convoy by 06.00 hours to-morrow, January 10, and will assemble at that time and date on the Shrewsbury—Church Stretton main road at a place half a mile south of Leebotwood (U. 39). This convoy when formed will come under the orders of an officer to be detailed by O.C. No. 8 Field Ambulance and this officer will be responsible for the clearing of such Advanced Dressing Stations of the Right Column as may be formed into the Main Dressing Station at Church Stretton. The motor ambulance transport of No. 7 Field Ambulance will be employed under arrangements to be made by the Officer Commanding that unit.

(4) (*a*) O.C. No. 7 Field Ambulance will, as soon as he has selected a site for an Advanced Dressing Station for the Left Column, immediately inform A.D.M.S. of its location by signal message.

(*b*) O.C. No. 8 Field Ambulance, and O.C. Company of No. 142 Field Ambulance detailed to accompany the two battalions of the 3rd Infantry Brigade mentioned in para. 2 of these Orders, will inform A.D.M.S. of the location of their Advanced Dressing Stations immediately they have been formed. This information is to be sent by motor cyclist. O.C. Divisional Motor Ambulance Convoy, half a mile south of Leebotwood, is to be informed also by the same means.

(5) D.D.M.S., 1st Corps has to-day forwarded by means of cars of No. 1 M.A.C. a reserve of stretchers and blankets to No. 7 Field Ambulance and No. 142 Field Ambulance. O.C. No. 142 Field Ambulance will forward 60 stretchers and 200 blankets to Headquarters, No. 8 Field Ambulance, making use of his motor ambulance transport for this purpose, when it goes forward to form the Divisional Motor Ambulance Convoy.

(6) Headquarters No. 8 Field Ambulance will be held in reserve ready to move forward on receipt of orders to do so. The remaining Company of No. 142 Field Ambulance (less personnel detailed to form the Staff of

the Walking Wounded Collecting Station) will remain in reserve at All Stretton.

(7) Reports and messages to A.D.M.S. at Divisional Headquarters at Dudgeley House (U. 27).

(8) Acknowledge.

(*Signed*) "X."

Colonel,

O.C. R.A.M.C. 1st Division.

Issued at 21.00 hours
through 1st Div. Signals.

Copy No. 1. 1st Division "G."
2. 1st Division "A."
3. No. 7 Field Ambulance.
4. No. 8 Field Ambulance.
5. No. 142 Field Ambulance.
6. Headquarters, 1st Infantry Brigade.
7. " 2nd Infantry Brigade.
8. " 3rd Infantry Brigade.
9. C.R.A.
10. C.R.E.
11. 1st Divisional Train.
12. A.P.M.
13. D.D.M.S., 1st Corps.
14. }
15. } File.
16. }

WORK DONE ON JANUARY 10.

On the morning of January 10 the syndicates left Shrewsbury at 09.00 hours to reconnoitre the line taken up by the enemy, and to form an opinion as to the arrangements that would be made by the Officers Commanding Nos. 7 and 8 Field Ambulances for the service of the troops of the 1st Division engaged in the attack on the enemy's line, the dispositions for which are given in Narrative No. 5.

The syndicates were informed that the A.D.M.S., 1st Division, having had no opportunity of reconnoitring the ground, must leave the selection of advanced dressing stations entirely to the field ambulance commanders concerned, and, also, that of a main dressing station and walking wounded collecting station, so far as the left column was concerned.

Each syndicate was, also, required to write, as A.D.M.S. 1st Division, the R.A.M.C. operation order for the field ambulances.

All officers were given instructions to meet the Director at 13.00 hours

at the road junction at P. 3567 where they were to hand in the R.A.M.C. operation orders written by the syndicates.

This programme of work was carried out and shortly after 13.00 hours, all officers were assembled on the summit of the high ground east of Stapleton (Pt. 387) from which place a good view of the enemy line was obtained.

After the Director had pointed out the enemy positions at Longden Manor, Longden, Exfordsgreen, Lyth Hill and Condover, which were distinctly visible, a discussion took place as to the positions to be taken up as advanced dressing stations for Nos. 7 and 8 Field Ambulances.

The Director was of the opinion with regard to No. 8 Field Ambulance, the leading field ambulance of the right column, that, as the headquarters of the two battalions, and in consequence their regimental aid posts, would most certainly be somewhere in the Great Ryton, Little Ryton, and Wheathall areas, an advanced dressing station should be opened by O.C. No. 8 Field Ambulance in Longnor. Longnor is rather far to the rear for an advanced dressing station, but the "carry" of the bearers detailed to clear the regimental aid posts could be reduced to about 500 or 600 yards by establishing a car post on the road at the south end of Little Ryton. The road from Little Ryton to Longnor is a good one and is not under enemy observation. Dorrington was not considered suitable as a site for an advanced dressing station. It is screened from enemy observation from Lyth Hill (P. 28) by the high ground east of Stapleton, but the roads to it from Great Ryton are directly under observation from Lyth Hill. Also, it is certain that the great majority of casualties to be sustained by the 2nd Infantry Brigade will fall on the two battalions ordered to capture Condover, at any rate in the opening stages of the battle. If the advanced dressing station for the service of the 2nd Infantry Brigade were established in Dorrington, it would mean that the great majority of the wounded would have to be carried to a flank instead of directly away from the front.

It may be assumed that the regimental aid post of the battalion of the 2nd Infantry Brigade ordered to demonstrate in the direction of Exfordsgreen will be in some sheltered position in Stapleton. This battalion is not likely to have severe casualties. In consequence a car post should be formed on the road south of the high ground to the east of Stapleton, to which lying-down cases can be brought by the field ambulance bearers detailed to clear the regimental aid post of the battalion in question. The car when loaded should proceed to the advanced dressing station at Longnor by the main road, and, when unloaded, return to its former position in readiness for further service.

It is considered that two light cars would be required for the service of the car post south of Little Ryton and one for that near Stapleton. These

three light cars, together with the horsed ambulance wagons of the two companies of No. 8 Field Ambulance, should be ample for the transport of serious cases to the advanced dressing station at Longnor.

They should be boldly used so as to shorten the "carry" of the field ambulance bearers from the regimental aid posts. The advanced dressing station at Longnor should be staffed by two officers, one from each company, and the nursing personnel and cooks of both companies of No. 8 Field Ambulance. The bearer personnel of one company should be allotted to clear the regimental aid posts of the battalions engaged with the enemy, while that of the other company should, in the early stages of the action, be kept in reserve in Longnor. The battalion of the 2nd Infantry Brigade, in reserve near Longnor, should bring any casualties they might sustain to the advanced dressing station by means of their own regimental stretcher bearers.

The action to be taken by O.C., No. 7 Field Ambulance for the clearing of casualties from the left column was then considered. The country in which the 1st Infantry Brigade is to operate is a very difficult one, and the enemy has good observation over most of it from Lyth Hill. The main road leading to the rear has exceedingly steep gradients, and it is the only available road by means of which casualties can be taken to the casualty clearing station at Horderley. In the opinion of the Director it would be unwise for O.C., No. 7 Field Ambulance, to establish a main dressing station for the left column south of Cothercott Hill (O. 61), owing to the delay which would arise, caused by the steep gradients, in clearing an advanced dressing station to a main dressing station, formed south of Cothercott Hill. It is very doubtful if the motor ambulance transport could be worked continuously on such gradients.

On this account it is considered that risks must be taken, and that it would be best to form only one dressing station to serve the purposes of both an advanced and a main dressing station. This dressing station should be opened in Castle Pulverbatch, which village is not under observation of the enemy on the ground.

The objections to this procedure are many, but it is impossible to offer a better solution of the problem.

One objection is that it will be necessary for the heavy ambulance cars of the motor ambulance convoy to come up to clear this dressing station, thus bringing them further forward than is usual. However, in war, risks must be taken if wounded are to be collected and evacuated quickly.

Slight cases should be sent on foot to a walking wounded collecting station formed at the Vicarage on the main road at T. 5488.

The regimental aid posts of the battalions ordered to attack Longden Manor may be assumed as formed somewhere in square O. 85, and they should be cleared by field ambulance bearers to a car post situated off the

main road at Black Lion Farm (O. 8547). The battalion ordered to demonstrate against Longden may be assumed to have its regimental aid post in the neighbourhood of Castle Place (P. 05); it should be cleared to a car post situated on the second class road near the Gorse (P. 04).

O.C., No. 7 Field Ambulance should staff his dressing station in Castle Pulverbatch with the headquarters of his unit, and the walking wounded collecting station with one officer and the nursing personnel of one of his companies. The remainder of the personnel of this company should be detailed to clear the regimental aid posts of the three battalions ordered to attack. His second company should remain in reserve, together with all motor ambulance transport not required for duty at car posts at Cothercott (O. 72).

1st Division R.A.M.C. Order No. 1 was then read out by the Director, and the Staff Tour came to an end.

SOME EXPERIENCES IN THE CONTROL OF FLY-BREEDING.

By Major E. B. ALLNUTT, M.C.

Royal Army Medical Corps.
D.A.D.H. and P., Bermuda Command.

The term "Prevention of Fly-Breeding" leaves nothing to be desired as a headline to a command order; those, however, who attempt to carry it out soon realize that to maintain even effective control of the breeding of house-flies requires constant supervision and unceasing labour.

Under modern sanitary conditions the house-fly cannot obtain access to one favourite form of breeding place, i.e., human excreta. Consequently, the female *Musca domestica* will for choice deposit her progeny in batches of 150 at a time upon that attractive and readily accessible site, horse manure.

In the effective treatment of horse manure, then, lies the solution of the problem of the prevention of fly-breeding.

To burn all horse litter in suitable incinerators is the easiest and most certain way of ensuring the desired result.

Unfortunately the local problem cannot be solved in this manner, manure being regarded as a most valuable asset in Bermuda, and every scrap of it is carefully preserved for use on the land. Therefore the method adopted for the treatment of manure must in no way detract from its subsequent value as a land fertilizer.

To deal with such existing circumstances, experimental work in manure treatment has been carried out during the whole of the past year.

The investigations led to the evolution of a simple and practical method for dealing with stable litter, which not only appears to be really workable and foolproof, but also actually to prevent the breeding-out of any house-flies in the manure so treated.

The principle of this method is the destruction of the house-fly in the larval stage by means of the treatment of horse manure by close packing combined with frequent "turning over" of the surface layers, and subsequent storage, entirely carried out in a suitable impervious receptacle so constructed as to form a larval trap.

The compression of moist manure by close-packing results in the centre of the heap becoming so hot, owing to fermentation, that the heat generated is quite sufficient to kill the fly larvæ which are hatched out from the eggs previously deposited by flies in the fresh manure.

It is found, however, that quite a considerable number of larvæ escape the heat in the centre by moving to the outer and cooler exposed layers of the heap.

Many of the larvæ which thus survive will, when mature, endeavour to

reach the cool dry earth, in which to pupate. Their migrations are prevented by the open channel in which they are entrapped and destroyed in the cresol solution. Furthermore, their escape over the walls is prevented by the projecting and over-hanging ledge which causes them to fall back on to the heap. The impervious platform base prevents larvæ from reaching the soil beneath the packed heap.

A certain number of these surviving larvæ will, however, remain in the cool outer layer of the heap and complete their development into adult flies. To remedy this, the outer exposed surfaces must be raked off and turned into the hot centre of the heap every other day during close-packing.

When a packed manure dump reaches a convenient size, it is stored for an adequate period, to ensure sufficient fermentation throughout, both to kill all surviving larvæ and also to render the manure so unattractive to flies that it may be safely used on the land without the possibility of further fly-breeding in it.

Based on these facts a standard type of two-stalled manure receptacle for local use has been constructed from existing manure pits. This has proved to be the most suitable type of structure for the purpose here, and with minor modifications should be adaptable to any local conditions. It consists of a platform slightly above ground level, walled in on three sides, with an open gutter in front. This manure receptacle cannot logically be styled a "manure pit," though, as the term is generally used to denote any form of fixed structure in which manure is deposited, it is employed in this article for the sake of brevity.

Each manure stall must be of adequate capacity to close-pack the daily accumulation of manure during the period in which the other stall contains the completed pack which is undergoing storage.

Although by these means fly-breeding can be prevented, the desired result will not be attained, unless each detail of the process is intelligently carried out by those concerned in the actual disposal of stable litter.

Method of Treating Stable Litter in a Two-Stalled Manure Pit.

Close-packing and Turning.—Into one of the two stalls of the manure pit, for example, the right hand one, the manure and stable litter is stacked daily.

Prior to stacking the manure, any excess of dry straw is raked off from the stable litter and burned.

Each day's manure is stacked on the previous day's supply and well beaten down with a spade, care being taken to pack tightly into the wall both at the back and sides of the heap.

The base of the heap must not be allowed to extend to within a foot of the open channel in front of the stall.

The manure must be kept moist; daily watering of the heap before beating down is therefore necessary in dry weather.

During close-packing the outer layers of manure on the exposed upper and frontal surfaces of the heap are raked off every other day and deposited in the hot, fermenting, deeper portion of the heap, the centre of which is opened up for the purpose.

Close-packing and turning over the surface is continued in this manner each day until the manure in the stall reaches to a height of within six inches of the top of the walls, when the other, in this case the left hand, stall is taken into use in a similar manner.

Each stall will contain, at least, ten daily additions of manure, provided that this is packed close after removal of the surplus straw litter.

A sliding wooden shutter is fitted to the open front of each manure stall. Its function is merely to protect the open gutter from falling manure, and it is not intended to assist tight packing in any way, for which it is not suited, either structurally, or from its position, and, it may be added, to obtain a really close-pack against it is not possible. The front surface of the manure is consequently to be regarded as an exposed one, and treated accordingly.

The shutter is to be removed each day before packing, and replaced afterwards, care being taken to make use of the stop on the retaining groove which is intended to prevent the shutter from closing completely down. This provision allows migrating larvæ to pass beneath the shutter to be trapped in the open channel beyond.

Storage.—The manure in the right-hand stall, now packed to its full capacity, is stored during the period of ten days or more, during which the left-hand stall is in daily use for close-packing.

Before the manure is left for storage, the exposed surfaces, i.e., the top and the front, are again turned over in the manner described above, hot fermenting manure from the centre of the heap being brought out and spread over the surface to replace the outer layer thus turned in. The heap is then beaten down firmly with the spade.

To further render the completed heap unattractive to flies during storage, it is recommended that a thin layer of earth mixed with cresol or crude oil be spread over the exposed upper and frontal surfaces of the packed manure, which is then left intact for ten days or more.

As an alternative in lieu of oiled earth, when this for any reason is not available, the excess straw from the stable litter, or some such dry refuse, is spread over the exposed surfaces of the packed manure and burnt, the resulting ash acting as a fly-deterrent during storage.

At the end of this period of storage the manure is removed from the right-hand stall, in order to make room for daily packing of manure therein; the left-hand stall by this time being fully packed.

Each stall is thus used alternately for packing and for storing manure.

After clearing out the manure from it, a stall will be sluiced down with a weak cresol solution before being again taken into use for close-packing.

The open channel or gutter in front of the pit is kept free from manure, all debris and dead larvæ being cleared from it daily.

It is kept filled with water to which cresol has been added, thus ensuring the destruction of fly larvæ which have fallen into it, and, at the same time, preventing mosquito breeding taking place therein.

The projecting ledge on the top of the walls is another device to prevent the escape of migrating larvæ, but to make it effective, care must be taken that the packed manure does not come into contact with it.

Having personally tested this method of manure treatment during the past year I have no hesitation in stating that if it is thoroughly and conscientiously carried out, no fly-breeding will result.

The standard type of manure pit shown in the figure is of sufficient capacity to deal with the manure from one horse, each stall being able to contain at least ten days' supply.

In this connexion it may be stated that the period of storage required to render the manure safe for land use varies with local conditions of climate, and can only be determined by experimental work in both the hot and cold seasons of the year.

In this colony it was found that, provided the manure treatment has been thoroughly carried out, further storage in the manner described for a period of ten days would suffice under any local weather conditions.

The two-stalled manure pit in its present form was evolved from old manure pits existing in most of the barracks and quarters of this command.

These rectangular structures, built some years ago of local limestone, cement faced, consist of a platform at ground level of an area averaging six by five feet, protected along the back and sides by walls some four to five feet in height, the front being open.

In their original form these manure pits were well adapted to close-packing treatment, as the supporting walls were found to be particularly suitable for obtaining a really tight pack against them; furthermore, the advantage of having only two exposed surfaces, i.e., the upper and front, of packed manure to "turn over" and also to cover for storage, is only fully appreciated when the labour involved in dealing with the five surfaces of a pack in the open has been experienced.

To render these pits adequate for their purpose, the wall surfaces on the inner side, which were full of holes and cracks which would harbour larvæ, were refaced with cement and concrete, and all corners and angles rounded off with the same material.

The next step was the erection of a medium partition wall from front to back of the same height as the side walls, thus forming two walls, one for packing the daily manure, whilst the other contains packed manure undergoing storage.

This precaution is a most necessary one, as attempts to pack and store manure at the same time in one continuous heap prove most unsatisfactory, and render fly-breeding preventive measures quite unworkable.

In spite of careful supervision in carrying out these details, the success of which was shown by the absence of pupæ or mature larvæ in the manure stall, conclusive evidence that fly-breeding was still taking place was obtained on examining the soil surrounding the manure pit, when numbers of mature larvæ and pupæ were unearthed.

The size of the platform has no apparent effect in deterring larvæ in their migration, as they were found to traverse a platform extending six feet and more from the base of the manure dump to reach the soil beyond.

To decide upon a method of trapping likely to prove successful a close observation was kept upon the habits of fly larvæ. Owing to the nocturnal activities of the larvæ, much of this investigation had to be carried out at night with the aid of flashlamps, and by these means their ways of escape were detected, and measures taken accordingly.

On the fifth evening after commencing close-packing, larvæ were seen to migrate from the heap, and escape from the stall by the open front. They then burrowed into the soil beyond.

The presence of an open half invert drain extending across the open front of certain manure pits was found to cause the destruction of some of the larvæ thus migrating, owing to their being drowned in the rain water which was retained when the drain became blocked.

This observation led to the use of this "water jump" as a larval trap, and its efficacy was further ensured by the adoption of Baber's [1] principle in its construction.

Investigations made here led to a gutter of this pattern being constructed, the overhanging lip forming an unsurmountable barrier to larvæ, whose escape from an ordinary half-invert channel was found to be a possible occurrence, especially if it was allowed to become dry or partially filled with debris.

The Baber type of gutter with its sheer drop from the overhanging edge, however, proved a veritable *descensus averni* to the migrating larvæ.

These gutters were at first made entirely of concrete and cement, but owing to the overhanging edges becoming broken away, even when protected by boards for the passage of a wheelbarrow, non-slipping metal treads four inches in width were let into the surface of the cement on each side to form a more durable lip.

This channel or gutter extends along the whole of the open front of the manure pit to just beyond the side walls, and is closed at one end, the other leading to a sump and soakaway, but guarded by a two-inch retaining lip to maintain the water level in the gutter.

The gutter measures three inches across from lip to lip, and from the lip to the invert it is three and a half inches in depth.

Cresol solution is retained in the gutter for its larvicidal action on both mosquitoes and house-flies.

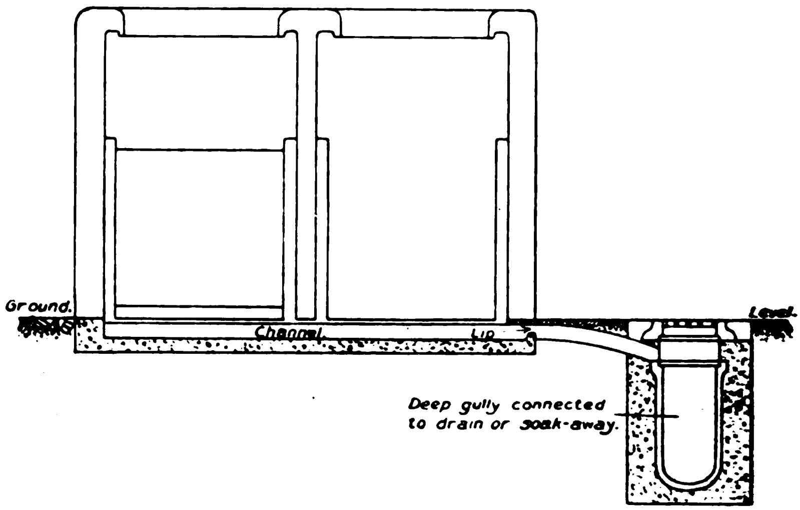
By this means migrating fly larvæ which attempt to reach the soil in front of the manure stall to pupate are caught and killed in the gutter trap.

The efficacy of the gutter as a larval trap was patent to anyone at a glance, hundreds of dead larvæ being present in the cresol solution on and after the fifth day of commencing a pack.

Larval activities were found, however, not to be limited to migrations from the open front of the manure stall.

In stalls packed with manure to the full height of the walls, fly larvæ were actually observed to traverse the upper surface of the wall, down the outer side of which they dropped to reach and burrow into the soil beyond.

To remedy this, the principle of Baber's [1] trapping device was again utilized in the construction of a lip with an overhanging shape edge, projecting two inches inwards, along the top of the walls of each manure stall.



Manure pit.

This edge was made to extend in continuity along the top of back, partition, and side walls, being carried down the front edge of the two last-named, to terminate at platform level.

This device proved entirely adequate for its purpose, as, in attempting to negotiate the obstacle, migrating larvæ were observed to fall back on to the packed manure in the stall below.

To render this safeguard effective, manure must not be allowed to reach or adhere to it; hence the injunction that packed manure must not extend to a height of within six inches of the top of the walls of the stall.

The efficacy of these devices is proved by the results obtained in the routine working of them.

The most thorough search in the soil in the vicinity of the manure pit on all sides failed to reveal a solitary larva or pupa; although hundreds had been found in such situations prior to the installation of the larval trapping devices.

The movable wooden shutter to each stall slides vertically in metal grooves in the side and partition walls about two inches behind the projecting lip. These grooves are blocked by metal stops, some two inches above the platform, which prevents the shutter being completely closed down, and thus allows space beneath for migrating larvæ to reach the gutter trap beyond.

The plan shows the various points described and the construction of the manure pits.

Practical Points in Working the Method.

The method was adopted in its entirety after prolonged trials in all varieties of weather conditions, during which other methods of manure treatment proved to be less satisfactory.

Thorough close-packing in itself undoubtedly causes the destruction by heat of large numbers of the fly larvæ present in the manure, but careful investigation reveals the fact that an almost equal number of larvæ escape to pupate and give rise to adult flies. In dry weather especially fermentation is inhibited to some extent in the exposed layers of manure, and larvæ reaching such cool surroundings are enabled to pupate and develop unchecked.

"Turning over" these surface layers regularly is found to deal most effectually with these survivors, who are killed at once by the heat in the centre of the pack.

Any excessive dryness of the stable litter may be remedied to some extent by removing from the manure before packing any superfluous dry straw, which may then be burnt, and also by drenching the manure heap with water each day before packing down.

Manure well packed and turned on a base of soil, even if the latter has been oiled and rammed down, may appear to be giving rise to no fly-breeding from the absence of larvæ and pupæ in the heap, but the fallacy of this will be quickly exposed if the ground beneath is examined, when pupæ and mature larvæ will invariably be detected.

The importance of an impervious base such as bare rock or a concrete platform for packing manure on is thus realized.

The close-packing of manure was first carried out in the original manure pits, and the observations made during the actual working on these lines led to the evolution of the standard type of manure pit now used throughout this command.

When supervising manure treatment in these pits a brief inspection is sufficient to detect faulty methods; the detection of pupæ, or even of mature larvæ in the outer layers of the packed manure, is definite evidence of neglect, namely, failure to "turn over" the surface manure every other day, whilst the presence of any surviving larvæ, at a depth of six inches or more, indicates that an insufficiently tight pack has been obtained.

It has been interesting to compare observations made in various manure

pits in use here. Although they were all of the same standard type, the results varied considerably as judged by the number of dead larvæ present in the gutter trap, on and after fifth day of commencing a close-packed heap.

The number of larvæ which survive to reach the gutter is in inverse ratio to the thoroughness of tight packing and turning over of the manure from which they migrate.

In a manure pit that is structurally intact, the absence of pupæ or mature larvæ anywhere in the stall of packed manure, together with few traces of destroyed larvæ in the cresol solution in the gutter, indicates thoroughness of method. It is, however, to deal with lapses, due to carelessness or neglect, that such safeguards are essential.

Manure treated and stored in this manner will then be safe for use on the land without any fly-breeding resulting, and furthermore, many agricultural experts state that its value as a fertilizer of soil is even greater than that of loosely stacked stable litter [2].

Experimental Work in Connexion with Fly-Breeding in Manure.

A large number of experiments were carried out in order to obtain the necessary data for standardizing a routine method for the treatment of manure in the command.

Fly-Breeding.—Observations were made both with fresh manure in tins or other close receptacles with a lid made of wire gauze, and also in portions of actual manure pits covered in with similar material.

It was found that under most favourable conditions of climate, the fly does not emerge from the pupa until the twelfth day after deposit of the egg in the manure.

This occurs during August and September, when the heat and relative humidity are both at their maximum. (Temperature 90° F., relative humidity 90 to 100).

Larvicidal Effects of Close-packing.—A series of experiments was conducted, in order to determine the temperatures reached at various depths and situations in close-packing, and the effects produced thereby upon fly larvæ.

It was noted that the larvicidal effects of certain temperatures and the length of exposure required vary with the stage of development of the larvæ, freshly hatched specimens prove to be less thermophylic than larvæ which have accomplished their second moult. Similarly, mature larvæ ready to migrate are slightly more tolerant to heat, whilst pupæ will survive even higher temperatures still.

These observations indicate the importance of "turning over" the surface of packed manure at least every other day, to ensure immediate destruction of the larvæ in their immature and most vulnerable stage of

development. Furthermore, the "turned in" manure must be buried into the centre of the heap, where the heat causes instantaneous death to the larvæ.

In actual practice it is found that temperatures at which larvæ are not killed in less than a minute are not really larvicidal to any great extent, for the simple reason that as soon as it becomes uncomfortably hot in the centre of the heap larvæ, other than those just recently hatched out, are sufficiently active to migrate and seek cooler surroundings without delay.

As regards the larvicidal temperatures recorded, the results obtained for the most part corroborate the observations made by other investigators of this subject.

If anything the fly larvæ appear in some cases to be slightly more tolerant to heat than previous records elsewhere would lead one to expect. It is probable that the stage of development reached by the larvæ is the factor in the case.

The larvæ used for the experiments were forty-eight-hours-old specimens, which would be the stage of existence reached by those "turned in" from the outer layers of the heap when this procedure is carried out, as it should be, every two days.

At 113° F. no ill effects were noted, but as the temperature of the manure neared 120° F., larvæ were seen to migrate rapidly to cooler surroundings, and if prevented from doing so soon succumbed.

At 130° F. death ensued within one minute, and at 140° F. it was instantaneous.

Mature larvæ ready to pupate were found to require slightly longer exposure to such temperatures to ensure their destruction.

The Effects of Fermentation on Manure.—Apart from the larvicidal heat generated in fermenting manure, investigations were made as to the effects of storage in rendering manure safe for use on the land, without any subsequent fly-breeding resulting.

The period of storage necessary was found to depend upon: (1) the closeness with which manure is packed; (2) climatic conditions.

As regards (1) manure tightly packed reaches the degree of fermentation required throughout, in approximately half the time taken by loosely stacked manure; (2) climatic conditions include both the humidity and the temperature of the atmosphere.

Excess of humidity, as in wet weather, rapidly increases the fermentation process, consequently in dry weather close-packed manure should be watered daily.

The effects of the temperature of the air vary with its humidity, in that warmth combined with moisture assists the process of fermentation, whereas extreme cold retards it, as does also dry heat. To solve our local problem of storage, a series of dumps of manure, of varying degrees of close-packing and watering, after fly-deterrent coverings had been applied, were stored

for different periods, both in hot and cold weather. At the end of such periods, these heaps were opened up, and examined for the presence of larvæ or pupæ, and the fermented manure was then spread out in situations where flies were prevalent.

It was conclusively proved that, under local weather conditions least suited to the process, manure well watered and tight packed, including, of course, regular turning in, is rendered safe for use on the land after ten clear days' storage.

It was noted that the degree of alkalinity (tested by litmus on manurial solutions) seemed to have a bearing on the attraction of some manure samples for the house-fly.

Larval Traps.—Many observations were made upon the habits of migrating larvæ, and their powers of climbing or negotiating obstacles, with a view to determining the efficacy of various larval trapping devices.

As regards climbing propensities, the surfaces of the walls of the manure stall being usually moist in this humid climate, mature larvæ are able to ascend vertically for several inches.

They can also climb out of an open channel pipe, especially if assisted by the presence of debris of any kind in the invert of the channel. In actual practice, however, this was a rare occurrence, as the presence of cresol in the channel quickly destroyed any larvæ thus entrapped. Tests carried out with the projecting ledge on a wall, and also with gutters constructed on Baber's (1) principle, proved the efficacy of this device in dealing with such larval activities, larvæ failing to overcome the obstacle provided by the overhanging edge in either instance, provided that the latter are kept free from manure or other debris.

At different times, trial was made of various types of larval traps, and the conclusion reached that, although many of these contrivances do assist to some extent in reducing fly-breeding, the method of trapping devised by Baber is by far the most satisfactory, both in its simplicity and the fool-proof manner of its working; furthermore, it is unique in that it is a definite method of fly-control in itself.

The ants (Formicidæ) prevalent all over this colony are not unnaturally regarded as a plague, all food supplies having to be adequately protected against their depradations. But scarcely an experiment was carried out without ocular evidence of the value of the ant as a fly larvicide. Considerable interest was aroused amongst the troops by the common spectacle in the vicinity of manure heaps, of struggling fly larvæ, each being carried off by three or four ants, to be subsequently deposited in the nests of the latter and destroyed there, as further investigations proved to be the case.

From the many observations made, it would appear that large numbers of venturesome larvæ carried off from the surface of manure heaps are destroyed in this way, and on several occasions flies' eggs were taken from fresh manure in a similar manner.

INVESTIGATIONS OF VARIOUS METHODS OF TREATMENT OF MANURE.

The method of manure treatment described above was not adopted without due consideration being given to other and simpler methods, which were only eliminated after thorough tests had proved them to be unsuitable for local use.

The following epitome of our experiences of various methods explains briefly the reasons for their being discarded for general use.

(*a*) *Incineration.*—Not feasible, as all manure is required for land fertilization.

(*b*) *Fly-Deterrent Measures* :—

(1) Spraying manure heaps with fly-deterrent solutions has often been favoured, apparently owing to the fact that immediately after spraying the manure no flies are seen upon it, consequently it is inferred that no fly-breeding is going on.

That this is a fallacy is easily proved by turning over the surface of the manure, when fly larvæ can be found beneath, the solution sprayed on to the surface having entirely failed to prevent the successful hatching and subsequent development of larvæ from the eggs of the house-fly previously deposited in the fresh manure. Furthermore, it was found that natural fermentation had been inhibited or delayed to some extent in manure drenched with such solutions as compared with control manure heaps which had not been so treated.

To provide a fly-deterrent covering for close-packed manure during the period of storage, substances such as crude oil or cresol have their uses, especially when mixed with earth in the proportion of about one part of oil to twenty-five parts of earth. The use of oiled sacking for this purpose proves unsatisfactory on the whole, as this material becomes very foul in time, and attracts all kinds of insect pests.

Solutions containing kerosene are sometimes tried, but are useful as a temporary measure only, as owing to dilution by rain or evaporation by heat, their effect is very evanescent, and flies have been observed depositing on the manure within a few hours of spraying.

(2) The so-called Panama method of burning a layer of straw or other dry and inflammable refuse on the surface of a manure heap is a useful measure and deters flies from depositing their eggs thereon, but is similarly fallacious as regards the apparent absence of fly-breeding, which may be found to be taking place in the manure beneath.

A certain number of larvæ are undoubtedly destroyed in the surface layers of manure by this means, and it is also a useful alternative to oiled earth for covering packed manure during storage.

(*c*) *The Spreading of Manure.*—This was carried out as a routine method during a period of eight months, including both the hot and cold seasons of the year. On the ground selected for the purpose, five areas were marked out, each of which was used in turn to receive the thinly spread day's stable litter, which was raked over and turned at least once daily.

On the sixth day, the area used for the first day was cleared and used again, and and so on in daily sequence, the manure so removed after five days' exposure being used on the land.

In dry and sunny weather, manure so treated did not give rise to fly-breeding, provided that a rocky or similar site was used for the purpose.

The adoption of spreading as a permanent routine method was defeated by the local climate, the constant humidity of the air preventing sufficient desiccation of the manure, and furthermore the strong prevailing winds carried fragments of the horse litter all over the lines.

Observations made under average weather conditions revealed the presence of fly larvæ in fragments of spread manure of less than 1 inch in thickness, and both larvæ and pupæ in the manure that had been stacked after five days' careful spreading.

Larvæ and pupæ were also unearthed from the soil in the vicinity of the spread manure, in instances where there had been neglect in regular spreading or turning.

Where a number of horses were concerned, there was often difficulty in securing a large enough area of suitable level ground for the spreading of five days' supply of stable litter.

The labour involved is a further disadvantage, and renders somewhat prolonged supervision necessary for the success of the method.

(*d*) *Storage of Manure in Closed Receptacles.*—Although this method is sound in theory, in practice it was found impossible to keep the receptacle fly-proof, even with the use of precautions such as a backstop to prevent the lid resting open. Our experience proved that under average working conditions this type of receptacle provided a perfect fly incubator, and cannot be advocated for general use.

(*e*) *Baber's Method* [1]. From the model (fig. 115) in Byam and Archibald's "Practice of Medicine in the Tropics," vol. I, a Baber enclosure was constructed nearly a year ago in the horse lines of an infantry regiment here [3].

Baber devised his platform for storing manure and freeing it from fly larvæ, and directs that the manure be firmly stacked upon it daily, and packed tightly against the wire fence.

Migrating larvæ fall into the surrounding gutters of characteristic shape with an overhanging edge, from which, if kept clear of manure, they are unable to escape.

It is recommended that these gutters be kept free from liquid, the larvæ being cleared from them and suitably destroyed.

Our experience in the working of the method over a period of a year fully bears out its value in the control of fly-breeding, large numbers of larvæ being trapped in the manner described. In fact this pattern proved to be by far the most effective device of its kind amongst the various methods of larval trapping investigated here. So much so, that the essentials were adopted to form the larval traps in our improvised manure pits, not only in the construction of the open channel, but also in a modified form as the overhanging lip which projects from the top of the walls of the manure stalls. In the course of many observations during the past year both these devices have fully proved to serve their purpose most adequately.

In the practical working of Baber's system it was found that fly-breeding, although well controlled, is apt to continue to some extent in the outside layers of the manure stack on its fly-exposed surfaces. It is not possible to obtain a really tight pack laterally against the wire fencing, in the vicinity of which, more especially at the base of the heap, large numbers of larvæ and nests of pupæ may be found.

The use of enclosures of the Baber type for our method of manure treatment was tested by actual experience. The conclusion reached was that for our use the manure stalls are more suitable from every point of view.

With the Baber enclosure, apart from the labour involved in dealing with the mass of manure on its five exposed surfaces, the fixed wire fencing is a disadvantage, not only because it is unsuitable for close packing but because its presence prevents free access to these surfaces for turning in, and also for covering up for storage. The conversion of the existing fencing to form hurdles of similar structure, but movable and attachable to the metal uprights at the corners, will remedy this, but on the other hand, the walls of the manure stalls of our pattern afford better surfaces for close-packing, and the stalled manure presents two surfaces only to deal with.

Furthermore, the walled manure pits in this climate have an added advantage, in that they prevent the stable litter from being scattered far and wide from the dump by the strong prevailing winds; this being apt to occur when open wire fencing is used for the enclosure.

Apart from such considerations the final decision was made, as is often the case, on financial grounds. The cost of converting the existing manure pits into the standard two-stalled type is only a third of that incurred in the construction of Baber enclosures of similar capacity, not taking into consideration the expense for upkeep of the gutters, the fencing, the metal of which soon deteriorates in this humid climate.

The period of storage of manure required to render it safe is a further factor in the question of expense. Manure stacked in Baber's enclosures requires three weeks' storage, and consequently adequate platforms to store all the manure which accumulates during that period is necessary. With the high degree of fermentation reached in the tight-pack obtainable in our

manure stalls, ten days' subsequent storage has proved adequate for the purpose at any time of the year here. This is most important from an economic standpoint.

A minor disadvantage in the use of the Baber platform is, perhaps, the large extent of the guttering, which is four or even five times that used in the manure stall type, and the labour involved in keeping such gutters clear is considerable.

Local conditions, however, generally determine the choice of the method of manure treatment, and I am convinced from a year's personal experience of the system that Baber's installation should prove effective in civil life, when the routine carrying out of such thorough measures as are entailed in our method cannot be ensured.

In places where manure has usually been dumped in haphazard manner, devoid of any system, and in consequence fly-breeding continues uncontrolled, the mere deposition of all stable litter in enclosures of the Baber type will undoubtedly result in great reduction of fly-breeding.

In military areas, where large quantities of manure in bulk have to be dealt with, as in the case of garrison manure dumps, it is an open question, and one which will be determined in each place by the various local conditions prevailing, whether the construction of Baber island platforms on a large scale, with or without movable fencing, will not prove to be more suitable than walled enclosures with a frontal channel, for carrying out the combined method advocated herein.

The Local Fly Problem.

The need for adequate measures for the control of the house-fly and its breeding places is a very real one here.

The prevalence of these pests in the colony is readily understood when the facilities for uncontrolled fly-breeding throughout the year are considered.

Motor vehicles are prohibited by law, the only means of transport being that provided by horses, some 3,000 of which are stabled in this small area of nineteen square miles.

The constant and plentiful supplies of horse manure, stored in heaps in the vicinity of livery and other stables, afford ideal sites for fly-breeding.

Economic conditions affecting civil and military communities alike necessitate the careful preservation of every scrap of manure to enrich the bare two foot covering of soil on limestone rock, every available acre of which must be cultivated.

The climatic conditions are most favourable to fly-breeding throughout the year, warmth and moisture being the most characteristic features; the air temperature varies between 60° F. and 90° F., with annual mean relative humidity of 84, and a rainfull of 50 inches, fairly evenly distributed amongst the months.

The constant presence of the enteric group of diseases in an endemic form amongst the civil population is a further incentive to a campaign against flies.

Observations show definitely the correlation of the seasonal variations in fly prevalence with the incidence of cases of enteric fever.

In this connexion it must be added that local water supplies obtained solely from rain water, collected mainly on roof catchments, and stored in suitable tanks, are not likely sources of infection, there being no surface fresh water on the island.

It may be added that protective inoculation, as carried out in the garrison here, is not generally adopted amongst the civilian population.

The abolition of many of the sources of fly-breeding throughout the colony would result from the substitution of motor for horse transport, which experiences elsewhere have shown to materially reduce the prevalence of house-flies.

In this connexion it may be mentioned that a marked diminution in the house-flies prevalent in London was noted to correlate with the general adoption of motor transport in the metropolis some years ago, due apparently to the conversion of stables into garages [4]. At the moment this radical change does not appear to be imminent here.

In such a constricted area as we have to deal with, and recognizing the fact that flies will normally travel distances up to one mile, to achieve any material results measures for fly control in civil and military areas must be co-ordinated.

The military authorities have adopted and put into practice the method advised herein, after a year's experience of it under local conditions, and it remains now for the civil Public Health Authorities to co-operate.

At the present time the local General Board of Health are considering the undertaking of similar measures of treatment of manure, with modifications to suit conditions in civil life.

Conclusions.

(1) The outstanding fact brought to light during these investigations is that no method of treatment of manure to prevent fly-breeding has the slightest chance of success without the intelligent assistance of those responsible for carrying out such measures in detail.

The education of these men must form the basis of the campaign against fly-breeding, to carry on which also requires the general interest of the garrison, obtained by suitable instruction in the form of lectures and practical demonstrations.

(2) The particular method to be adopted in any locality will be decided by local conditions, both economic and climatic, but it is most important to determine by thorough investigations whether the method selected will work successfully at all times of the year.

The value of experimental work in this connexion will be appreciated when it is realized that, as was the case here, a suitable manure pit was evolved from one already existing, at a much less cost than constructing new ones.

(3) Although many of the recognized methods of treating manure control fly-breeding to some extent, a combination of several such methods may actually prevent it.

(4) To ensure success, it is advisable to have a foolproof device to counteract the effects of slackness in carrying out the work involved, and not to be entirely dependent on the human element, which is liable to fail at times.

(5) The combined method which gave successful results in Bermuda should prove the solution of the fly problem wherever manure is accumulated for future use on the land.

The whole question of the prevention of fly-breeding has been tackled here from a practical standpoint, and although no new or startling facts have been elucidated, the conclusions reached may lead to a more general consideration of the inadequacy of the present methods of dealing with this problem in many places.

I am indebted to Qrmr.-Serjt. A. Cox, Royal Engineers, for the drawing of the two-stalled manure pit.

REFERENCES.

[1] BABER, E. "A Method of Trapping Fly Larvæ in Manure Heaps," *Lancet*, March 30, 1918.
[2] AUSTEN, E. E. "The House-Fly as a Danger to Health," p. 17. Economic Series, No. 1, British Museum (Natural History).
[3] BYAM, W., and ARCHIBALD, R. G. "The Practice of Medicine in the Tropics," vol. i.
[4] SHIPLEY, A. E. "The Minor Horrors of War," chapter v, part 1.

SOME PROBLEMS IN RECRUITING.

By Captain R. A. MANSELL, M.B.E.
Royal Army Medical Corps.

Regulations deal and can deal only with main principles, and it remains as part of the task of an officer to acquire such knowledge or skill as will allow him to manage the smaller details in conformity with the general rules. Such problems of detail arise in few places more constantly than in the medical inspection room of a recruiting office. The co-ordination of medical recruiting duties under the Directorate of Hygiene and the provision of instruction at the London Central Recruiting Depot are doing great work towards the institution and teaching of standards helpful in dealing with the problem of the "border-line" case, but there must be much useful experience stored away in the Corps which, if committed to print, would help officers in many a difficult situation, and the object of these notes is essentially to ask questions in the hope that someone who has the knowledge may also spare the time to answer them and others arising from them.

Time and again will combatant officers remark on the strangeness—to them—of the fact that medical men differ in their opinions, and particularly do they stress their arguments by reference to recruits. The answer to such arguments, and indeed to many if not all of the problems of recruiting, lies largely in the ability of either side to appreciate the other's point of view and difficulties. The critic of the examining medical officer sometimes fails to remember that his victim is but human, however, trained; the examining medical officer may fail to estimate correctly the mentality of the man he passes into the Service and find himself responsible for one who, from the start, sets out to drain to the dregs his privilege of medical attendance and who, with his minor unimportant blemish can cause more trouble than several really sick men. This attempted estimation of the mentality—psychology, if you will—of the potential recruit cannot be unimportant. The "desirable" recruit, even though he have minor physical defects, will possibly make a better soldier than the physically perfect specimen who shows what one might call stigmata of undesirability—a surly manner, a shifty eye, a long history of short term employments, or of no employment at all—and whereas, from the medical point of view, there may be no justification for rejecting the latter, with the former a degree of laxity within the recognized standards may even be advisable.

Most old soldiers will admit that there was a time in their service when they hated the Army with a hate perhaps concentrated on one or a few individuals, perhaps generalized to the whole system as they saw it, but at any rate sufficient to obliterate for the time that which stood to them

for a conscience, and most of these will place that period during their early recruit training. We must be prepared to appreciate the recruit in this frame of mind; not entirely blaming the man—he is a stranger in an even stranger land, and to him the devil he knew seems to have been more desirable than the God he has not yet learnt to worship—but firmly urging him towards the completion of his training.

It may be perfectly true that an army marches on its stomach, but "flat foot ranks fourth on the list of disabilities which caused the greatest number of men to be invalided out of the Army as unfit to serve": this arresting statement is contained in the Report on the Health of the Army for 1923.

Definite flat foot, with its eversion and abduction, is usually easy to detect in a candidate for enlistment, but the degree of "lowered plantar arch" which we may accept is an extraordinarily difficult thing to estimate, particularly when we realize that many men know of their disability and strain every muscle to overcome it temporarily. Some of the factors influencing this decision are the man's ability to restore the arch on tiptoes, his ability to hop and jump and the muscular development of his legs. The elasticity of the normal foot lies in its structure as a series of arches, longitudinal and transverse, and in the healthiness of the ligaments and muscles supporting them. The importance of the longitudinal arches, especially the internal one, is known to and stressed by all, but is sufficient attention generally paid to the transverse arches, particularly the tarsal one? The internal longitudinal arch may be dropped almost to flatness and yet be made recoverable and functionally useful by muscular action, but it seems worth while trying to find out whether the same is true of the transverse tarsal arch; certainly the majority of really flat feet, and of those lowered plantar arches which appear too low, or do not recover enough, to be acceptable in recruits, feel definitely flattened over the dorsum of the tarsus. Can we, if it be of value, devise any rapid manual or visual test to decide this?

The normal prominence on the middle of the inner side of the foot—the tuberosity of the scaphoid—is definitely anterior and slightly inferior to the tip of the internal malleolus; when this prominence—be it of the scaphoid or of the displaced head of the astragalus—becomes obviously more inferior than anterior to the point of the malleolus, then it would seem that, definitely, we are dealing with a foot which will go from bad to worse and with one which is beyond that stage in which such orthopædic treatment as can be given to a recruit will produce any benefit.

Regarding the musculature of the leg, that on the front must, of course, be viewed with equal care to that in the calf, and the presence of a reasonably well-developed tibialis anticus seen and felt in action may be a valuable deciding point in a doubtful case of apparently lowered plantar arch.

Pes cavus, though not so common, is perhaps even more disabling than

pes planus, and there is occasionally met with a pes cavus which is becoming, or has become flattened out; these feet, in their intermediate stages, though not actually flat, are definitely inelastic and useless for marching; there is often an apparent or actual concavity of the inner border of the first metatarsal which looks abnormal and suggests a more careful examination.

Turning now briefly to the heart—that very fruitful source of invaliding—one is faced, in the prospective recruit, with problems at almost every turn. Provision is now made in Regulations for the previously difficult case of the nervous, possibly that day unfed, probably over-smoking, youth with tachycardia, and it is often possible to assure oneself that one or all of these causes is the real origin of the condition, so saving a recruit to the Service. The addition to one's routine of simple effort tolerance tests is of incalculable value—many hold that they should never be omitted; but even these may be temporarily upset by one or more of the above causes to such an extent that the results may be difficult, perhaps useless, to interpret. The mere process of examination, especially if it has to be carried out rapidly, forms a very fair "effort" to which a man may be submitted without his attention being directed to his heart at all, so that the localized nervous effect may be to some extent eliminated. If, however, an effort tolerance test is to be used it would seem reasonable to insist that it be of the heavy rather than of the light order. The recruit, despite any personal views he may hold on the matter, is enlisted into the Army for work, and for work, especially as a recruit, of a very arduous nature, and the not infrequent appearance of the so-called "effort syndrome" or the development of the worse-called D.A.H. may simply be evidence, not of any form of disease, but of the fact that we are trying to get, so to speak, forty horse-power work out of a ten horse-power engine.

Whilst it is common knowledge that every heart that murmurs has not got valvular disease, and that the cardinal tests of cardiac value are the size of the organ and its reaction to and recovery from exercise, yet it is probably unwise to admit to the Army any man with a bruit over the cardiac area; sooner or later he will learn about it, and he is a stout and indeed very intelligent man who, knowing this, can accept his physician's statement (and even physicians differ at times) and disregard the affair. A series of careful examinations and a few days' observation in hospital regarding the condition of his heart will turn all but the staunchest of soldiers at least into hypochondriacs.

Editorials.

REVISED CONDITIONS OF SERVICE FOR ARMY MEDICAL OFFICERS.

THE announcement by the Prime Minister in the House of Commons on July 15 that the Government had decided to adopt the recommendations of the Interdepartmental Committee on the Medical Branches of the Fighting Services, under the chairmanship of Sir Warren Fisher, G.C.B., has been closely followed by the publication of Army Order 196 on June 29, setting forth the new conditions of service and rates of pay of the Royal Army Medical Corps and Army Dental Corps. Warrants have been issued by the Admiralty and Air Ministry setting forth similar improvements in their respective Medical Services.

The Army Order will be looked upon from very different points of view by officers of the Corps according to their seniority, their prospects of promotion, their domestic affairs, the extent to which they have suffered under the old Warrant, their desire to cleave to their old allegiance or to try their fortunes in civil life.

We, however, can only look at it from the Corps point of view, and from that standpoint certain far-reaching facts stand out.

The reduction in the length of service necessary to qualify for the gratuity of £1,000 from eight and a half to seven years gives the young officer, after his first tour of service abroad, the opportunity of deciding, before he comes up for the College course, whether he will accept the service as a career or take the gratuity to help him, while yet young enough, to start at the bottom of the ladder in civil practice. Should he elect the former alternative he has the prospect of a substantial rise of pay after eight years' service, sufficient to tide him over the incidental expenses while attending the Senior Course at the Royal Army Medical College, London.

Having passed through the Senior Course at the College and qualified as a specialist the successful officer now is granted specialist pay at the rate of 5s. per day, whatever subject he may have taken up. This concession, pleasing though it may be to hygiene and pathology specialists, will not yet have solved the controversy whether it is better to hold a fixed appointment with allowances taxed, or to be subject to movement where and when one is most required and have the satisfaction of drawing all allowances in full.

The enhanced gratuities at fifteen and eighteen years' service make it easier for officers, who are not as young as they were, to find employment

in civil life, if forced to retire from the Service whether for family reasons, reasons of health, inclination or because they consider that the opportunities and experience which the Service has provided have qualified them for consultant practice.

At this stage the real benefits of the new rates of pay for the serving officers are most apparent. The Major of over fifteen years' service has now lost the gloomy prospect of ten years' service on his maximum rate of pay, already inadequate to meet the needs of a growing family. These officers have real cause to bless the Warrant, which removes, however inadequately in individual cases, a hardship which has existed for many years.

The Lieutenant-Colonel now obtains the same rate of pay as a Lieutentant-Colonel Commanding a battalion with Command pay. The comparison is just, and charge pay and specialist pay are still available for the R.A.M.C. officer.

Finally the Director-General assumes his rightful place and obtains the pay of his rank, a change which, though it in fact took place in 1918, and only became apparent to officers of the Corps when his name, together with those of Major-Generals and Colonels, was removed from the usual page in the Army List, has now become real. Its reality having been established we believe the whole Corps would welcome the restoration of his name to the Corps list, for he is still, sentimentally at any rate, the real head of the Corps. This view we are sure our distinguished Colonels-Commandant will not oppose.

So far we have dealt only with serving officers. Neither candidates nor retired officers have been left out.

The retired Major who was serving in 1919 is now assured of his vested right to a minimum pension of £1 per day after twenty years' service. This pension has been almost a fetish in the Corps since its inception. Many of us knew little else about the Corps when we first contemplated joining it in our student days, and that £1 per day became so much more valuable in our eyes than plain £365 per year. We rejoice at its restoration to those who were born into the Corps under its influence.

New entrants will have no such fetish but have instead the grant of an antedate up to twelve months to candidates who have held a house appointment before entering. This concession is of even greater value than our old £1 a day pension as those who are reaching the senior ranks of the Corps will realize without hesitation.

Such are the main points of the Warrant which appear to us to be of importance. In the laborious process of its evolution we are indebted to the personal interest of the Secretary of State for War, to the War Office staff, the Army Medical Advisory Board, the British Medical Association and last but most of all to our late Director-General, who spared neither himself nor others in his compelling desire to bring the issue to a successful end. The unique personality and clear thinking which we know so well carried

all before him and with him, and it was a tragedy that he did not live to hear the successful result which for months had been his most ardent wish.

The Corps has still a difficult path to tread and much lost ground has to be regained. This can only be done by united effort and contented endeavour, in securing which we are sure that gratitude to our late Director-General and loyalty to our new one will play a large part. With this hope we give the new Warrant our blessing and look forward with confidence both to the disappearance of unrest within the Corps and to a steady influx of that new blood—replicas of ourselves—of which we stand so much in need, to carry on our splendid traditions in the days to come when the post-war gap in our ranks will have to be bridged.

REPORT ON THE HEALTH OF THE ARMY FOR THE YEAR 1924.

LAST year we commented on the new arrangements made in the Report for 1923 and we are glad to see that these have been continued in the present report. Its completion within four months of the report for 1923 must be considered a great achievement.

The improvement in the health of the troops, noted in previous reports, has been maintained during 1924. The principal causes of admission to hospital were malaria, venereal diseases, influenza, inflammation of tonsils, inflammation of areolar tissue, inflammation of bronchi and sand-fly fever.

The commands with the highest ratio of inefficiency were North China, Iraq and West Africa; while Bermuda, Mauritius, and at Home had the lowest ratio.

The number of invalids discharged from the Army was 2,500 or 13·00 per 1,000 of strength; a figure which compares favourably with the two previous years, but is still twice as high as it was in 1913.

The principal causes of invaliding were: Inflammation of the middle ear, tuberculosis, disordered action and valvular disease of the heart. Pulmonary tuberculosis shows a decrease of 20 per cent, but valvular disease of the heart an increase of 54 per cent.

The principal causes of inefficiency on account of sickness in hospital were: Gonorrhœa, malaria and influenza.

Under the heading "Notes on Diseases" are presented the salient features of diseases and disabilities causing inefficiency in the Army throughout the year; the diseases are dealt with in the order in which they appear in the statistical tables.

The total admissions for dysentery were 810 as compared with 1,269 in 1923. There was a marked reduction in the incidence rate in Iraq and a smaller fall in India. It is noteworthy that in Egypt 149 cases were diagnosed clinically and yet the *Bacillus dysenteriæ* was isolated from only

seven cases, five of which were Flexner infections and two Shiga. Of the total admissions 707 were diagnosed amœbic, 48 bacillary, and 54 were unclassified. Of the total number of cases 670 occurred in India, and Major Manifold has shown that in the case of Poona during 1925 nearly all the cases were bacillary and that the causes of the failure to isolate dysentery bacilli were faulty collecting of specimens and failure of speedy dispatch to the laboratory. Macrophage endothelial cells containing blood-corpuscles were also erroneously diagnosed as *Entamœba hystolytica*. There can be little doubt that further investigations on the lines suggested by Major Manifold will show that the great majority of the cases of dysentery in India and probably in Egypt and Iraq are bacillary in origin.

There were only 210 cases of enteric fever "among other ranks" in the whole of the Army during 1924. The Army in India showed the highest incidence; the 181 admissions to hospital were differentiated into the following groups: typhoid fever 62, paratyphoid A 36, paratyphoid B 10 and enteric group 79. The bulk of the cases occurred in the Northern, Eastern and Southern Commands. The inoculation state of the British troops showed that 95·3 per cent had received protective inoculation.

A fatal case of paratyphoid infection occurred in Cairo; there were no intestinal symptoms and pain in the hip with high fever and rigors suggested osteomyelitis. The specific bacillus was isolated from the blood during life and from the spleen after death.

An unusual case was reported from the Queen Alexandra's Military Hospital, Millbank. The patient had acute abdominal symptoms and appendicectomy was performed. Post-mortem examination showed an engorged spleen and swelling of Peyer's patches. The *Bacillus aertrycke* was isolated from the spleen, liver, heart's blood, and duodenal contents.

In the home commands there was a sharp outbreak of influenza in the early months of 1924. There were 5,667 admissions, but most of the cases were mild. In January at Aldershot there were a few disquieting cases of cyanotic purulent bronchitis. Protective inoculation was carried out, but there are no reliable statistics available to show the amount of protection afforded.

Malaria again caused the greatest number of admissions during the year; there were 13,644 as compared with 13,158 in 1923. In India alone there were 12,120 admissions, corresponding to a ratio of 206·8 per 1,000, compared with 172·2 per 1,000 last year. Excluding India there is a reduction of admissions, accounted for by the evacuation of Turkey in 1923, and by an improvement in the returns from West Africa, Iraq, and Egypt. The loss of service caused by malaria in India is serious, and the intensive study of vectors, breeding-places, &c., which, we were informed, was taking place last year does not seem to have borne much fruit as yet. We realize that a considerable expenditure of both time and money will be required to deal adequately with vectors and breeding-places, and the results achieved, except in favourable circumstances, such as obtained

at Ismailia in Egypt, are often disappointing. The lessons of the war showed that money spent on individual protection was most likely to give immediate results in very malarious areas. We are, therefore, glad to see that the importance of individual protection has been the subject of a special Indian Army Order, and that lectures on the subject are being given to all ranks. The sum of Rs. 100,000 which has been sanctioned for carrying on antimalaria measures is quite inadequate, and we share the hope that sufficient money will be given to mosquito-proof barracks in the worst stations.

The Northern Command in India has an admission-rate of 409·5 per 1,000, and occupies the first place among malarious localities, Waziristan being second with 346 per 1,000. In Amritsar and Lahore the admission-rate varies from 1,796 to 1,038 per 1,000—a far worse record than the West Coast of Africa. Special attention is being given to Lahore, which maintains its evil reputation as a hot-bed of infection during August, September, and October.

Sand-fly fever, which ranks sixth in the list of diseases causing admission to hospital, caused fewer total admissions in 1924, but this reduction is mainly due to the evacuation of troops from Turkey. In Iraq, Malta and India, the admission-rate per 1,000 is higher than last year. In Egypt the rate has decreased, but on the other hand, admissions for pyrexia of unknown origin have increased.

The ratios for tuberculosis are lower than last year and are now below the 1913 record. A fatal case of tubercular meningitis is reported from Aldershot: the symptoms suggested meningococcal infection. No micro-organisms could be found in the cerebrospinal fluid, but when a few drops of the fluid were injected into a guinea-pig the animal developed generalized tuberculosis and tubercle bacilli were found in the lymphatic glands.

There has been a steady fall in the incidence of venereal diseases during the last four years and the figures for At Home and Overseas (excluding India) are now well below the pre-war figures. This happy result is attributed to vigorous antivenereal propaganda and to advances made in the prevention, diagnosis, and treatment of venereal diseases. There has been a much greater fall in the figures for syphilis than for gonorrhœa; modern intensive treatment has reduced the number of infective syphilitics and self-disinfection appears to be more efficacious against syphilis than against gonorrhœa. The figures for India are not yet down to the pre-war level, though they appear to be steadily diminishing. The value of well-organized treatment rooms is shown by the experience at Quetta, where out of 4,788 men treated in the centre during ten months only two subsequently developed venereal disease. In the central Dermatological Laboratory at Poona, 21,210 tests and examinations were made. This laboratory forms a centre for research and instruction in venereal diseases for both the British and Indian armies in India.

An outbreak of what appeared to be typhus fever in a convalescent

camp close to Singapore was carefully investigated by Dr. Fletcher. The Felix-Weil reaction was positive in all the cases and reached its highest titre towards the end of the third week. There was no evidence of the spread of infection from case to case and lice were conspicuous by their absence. Native herdsmen grazing cattle on the site of the camp were found to be suffering from the same form of typhus and it was suggested that ticks might be the vectors of the disease.

Middle-ear disease still heads the list of diseases which cause the greatest loss of men through invaliding, though there has been a fall in the number invalided as compared with 1923. Greater attention is being paid to the examination of the ears in the case of possible recruits and an auriscope has been issued to all centres where recruits are medically examined. As a result there has been an increase in the number of men rejected on examination for this cause, but a decrease in the number discharged within six months of enlistment.

The number of admissions for valvular disease of the heart is about the same as last year, but the number of invalids has increased from 90 to 139.

There were 674 admissions and 147 men were invalided for disordered action of the heart. An analysis of 158 cases made with figures supplied from Netley, Aldershot and Woolwich showed that the majority of the cases had one to five years' service, and sixty-four per cent were invalided. Of seventy-one cases from India admitted into Netley Hospital seventy-five per cent were invalided; the majority of the men were of poor physique.

The committee appointed to deal with the question of disordered action of the heart is not yet in a position to make a final report. An analysis of some available material shows that in cases of disordered action of the heart there is evidence of a pre-enlistment disability and the association of a constitutional tendency and when such evidence is forthcoming there is little hope of the patient ever becoming an efficient soldier or fit for the strain of service at home or abroad.

Tonsillitis caused 5,248 admissions compared with 5,566 in 1923. In North China and Jamaica the incidence was higher than last year, but in most other stations there was a slight fall in the number of admissions. In the Scottish Command observations were made on the relation of the modernity, shape, and design of barracks to the incidence of tonsillitis and sore throat. The difference between old barracks and modern barracks was in January as 3·6 to 1·2; in March as 6·8 to 0·6; in July as 3·7 to 0·3; in August 5·1 to 1·6; and in December 5·2 to 0. The barracks of both categories were located in Edinburgh, consequently local climatic influences were eliminated. Cold and damp weather, dust and excessive cigarette smoking are supposed to play a part in the production of tonsillitis. The Directorates of Hygiene and Pathology have carried out a combined research on the bacterial flora of tonsillitis; streptococci, staphylococci, *Micrococcus catarrhalis* and pneumococci are the usual predominating

organisms. The results of fifteen months' work are, so far, inconclusive, owing to the difficulty of obtaining uniform and reliable data.

We are inclined to think that the incidence of sore throat in barracks is closely related to the wall space available per soldier. In many barracks owing to the shape of the rooms and the position of fire places and doors the six feet of wall space per bed is not obtained and we are glad to see that action is being taken by the Directorate of Hygiene to remedy this by reducing the numbers in rooms, re-distributing beds, stencilling correct positions on the walls, and by pulling away from the walls or reversing alternate bedsteads.

There were fewer cases of jaundice in 1924, mainly due to the evacuation of Turkey.

There were 881 admissions for appendicitis compared with 749 in 1923. Early operation on all acute cases is now carried out and the paramedian incision employed as it gives access to all parts of the abdomen and is not likely to be followed by ventral hernia. The results of cases and submitted to operation are very satisfactory and only five cases have been invalided as unfit for further service. In some cases where the patients had previously suffered from dysentery and still had symptoms of abdominal pain and discomfort a complete cure was effected by removal of the appendix.

There were 5,689 admissions for inflammation of areolar tissue as compared with 6,441 in 1923. When the larger hospitals are equipped for treating cases as out-patients which are beyond the scope of the medical inspection room, it is hoped that there will be a further reduction in the cases requiring admission to hospital.

There has been a further reduction in the incidence of scabies, which is attributed to improved prophylaxis and to the Danish method of treatment with Marcussen's ointment which is now in general use and rapidly effects a cure without producing any dermatitis.

Fractures rank sixth on the list of conditions causing a high inefficiency rate. There were 1,487 admissions and twenty-four deaths mostly due to serious fracture of the skull. Cases were retained in hospital for a shorter period this year and only 2·0 per cent were invalided as compared with 3·3 per cent last year, which is satisfactory. There has been a revival of direct operative fixation of fractures in selected cases so as to secure more accurate apposition of the fractured surfaces, but as the consolidation of callus is thus delayed caution has to be exercised as to the time which must elapse before the normal use of the limb is resumed.

In response to a request from the surgical department of the United States, inquiries were instituted as to the occurrence of malignant disease as a sequela of gunshot wounds, but in no instance could any connexion be found between the two conditions.

The results of abdominal operations have been very satisfactory. There has been greater accuracy in diagnosis. Abdominal cases often present

great difficulty owing to many of the patients having suffered from attacks of dysentery, and symptoms attributed to this disease have disappeared on the removal of a chronic appendix.

Under the heading of "Special Departments," notes are given of special points in connexion with medicine, surgery, pathology and hygiene.

The section devoted to medicine contains an interesting account of some cases of kala-azar treated at Netley after initial treatment with tartar emetic in India. These cases indicate clearly that there must be no intermission in the administration of the drug until it is certain that the patient has been cured of his infection, as relapses may be refractory to treatment with tartar emetic. Relapses at Netley were successfully treated with Von Heyden 471, which is more easily tolerated than tartar emetic, and does not appear so toxic. The introduction of Von Heyden 471 is considered a distinct advance in the treatment of leishmaniasis.

Most of the cases of dysentery admitted into home hospitals are relapses of amœbic infection. Stovarsol is rapidly replacing emetine in the treatment of these cases.

Diseases of the digestive system, which cause a large number of admissions to hospital each year, have been studied by the medical specialists. Most of the cases showed a hyperchlorhydria, and Hurst's diet has been employed with encouraging results.

Encephalitis lethargica occurred sporadically in sixteen cases, and it seems that a man who has suffered from the disease will never again be fit for active service owing to the serious effects of the sequelæ.

A case of meningococcal septicæmia was transferred from the Rhine Command, and the details are of interest in view of Colonel Kennedy's paper in last month's Journal.

In the section of surgery we are glad to note that the dearth of experienced surgeons, which was evident immediately after the war, has been made good, and qualified surgical specialists are now available in all the principal military hospitals.

The training of the Army surgeon is designed to produce an efficient general surgeon, and while the invaliding rates indicate the efficiency of the surgical treatment, it must be remembered that many men who fail to reach the standard of recovery necessary for Army work may yet be efficient wage-earners in civil life.

The reconstruction of operating areas has made good progress. Shorncliffe has now an excellent operating area, block of surgical wards and a new X-ray room. At Devonport, Colchester and Edinburgh the operating areas have been reconstructed and improved by the addition of necessary annexes, and X-ray rooms have been provided at Colchester and Edinburgh.

Suggestions for out-patient departments have been put forward for the Cambridge Hospital, Aldershot, and for the Queen Alexandra Military Hospital, London. Such a provision will enable a number of cases to be

treated as out-patients who would otherwise require admission to hospital, with a consequent saving of expense.

Under the Directorate of Hygiene the improvement in accommodation of the soldier and his family is making steady progress. A new type of emergency ration has been evolved, furnishing 1,700 calories with a weight of twenty-one ounces in place of the present ration giving 2,800 calories and weighing thirty-eight ounces. Specimens of the new ration have been manufactured in the College, and are now being tested for keeping qualities.

Further experimental work is being done on lemon juice. A simple test of its efficacy is required, but up to the present the only reliable method of judging its vitamin efficiency has been by animal experiment, which cannot be carried out for every sample. There appears to be no correlation between anti-scorbutic power and content of volatile oil.

For the water sterilization test case cadmium solutions have been found to have better keeping qualities than the present zinc iodide solutions.

The Army Hygiene Advisory Committee has dealt with the following important subjects: (1) Organization of Army cleansing units; (2) adapting mobile hygiene laboratories for transport on a trailer; (3) Army boots; (4) new types of buildings for married soldiers' quarters, a barrack block for sixty men and two non-commissioned officers, a barrack block for thirty men and one non-commissioned officer, cookhouses, dining-rooms and bath-rooms.

Under the Directorate of Pathology there has been a great increase in the volume of pathological work carried out during the year. Over 80,000 pathological examinations have been carried out in military laboratories at home and abroad; of these 35,000 were made for the investigation of cases admitted to the Queen Alexandra Military Hospital, Millbank, and to the Royal Herbert Hospital, Woolwich. Observations have been carried out at the Royal Army Medical College and elsewhere on the comparative values of the various serological tests for syphilis, with closely parallel results. The Sigma test has proved very useful in small stations where there were few cases and the application of this convenient test has been made possible by the provision from the United Kingdom of a standardized antigen which will remain fresh when kept in warm climates for many months.

Research work on the production of a vaccine against bacillary dysentery has been continued and promising results have been obtained by culturing the organisms under anaerobic conditions; it has been demonstrated that the introduction of this anaerobic vaccine into man and animals does not cause after-effects of undue severity, but is followed by the appearance of antibodies in the blood.

Mono-specific agglutinating sera for the food poisoning group of bacilli have been prepared and are now available for issue to all military laboratories. When the infecting organisms have been isolated these sera should render their immediate identification possible.

The general collective research on tonsillitis has already been referred to and on the advice of the Army Pathological Advisory Committee is being continued, especially with regard to the proportion of hæmolytic streptococci found in normal and inflamed throats and their association with outbreaks of scarlet fever.

Blood-counts of X-ray workers have been made; seven observers report no variation in the blood condition.

The hygiene and pathological services of the Army in India have been re-organized and it is satisfactory to learn that a specialist in pathology will now be appointed to the district laboratory in each of the fourteen districts.

Dental inspection and treatment of soldiers has developed into a routine system and continued progress has been made in the amount and standard of treatment carried out during the year under review.

The medical examination of recruits has been placed under the supervision of the Senior Medical Officer, Recruiting, London, who has been made responsible for co-ordinating the work of all medical examiners of recruits. As a result of this organization, there has been a considerable reduction in the numbers rejected on examination for enlistment and discharged within six months of being passed fit. Before taking up an appointment as A.D.H. or D.A.D.H. an officer now undergoes a fortnight's course of instruction in the medical examination of recruits at the Central London Recruiting Depot.

The ratios per 1,000 rejected on examination for enlistment and discharged within six months of enlistment show a decrease of 12·89 and 10·35 respectively compared with 1922-23.

The principal causes of rejection were: loss and decay of teeth, defective vision, defects of the lower extremities, under chest measurement, other diseases of the heart, flat feet, diseases of the middle ear, valvular disease of the heart. There were no very marked changes in the ratio of rejections on enlistment in the different classes.

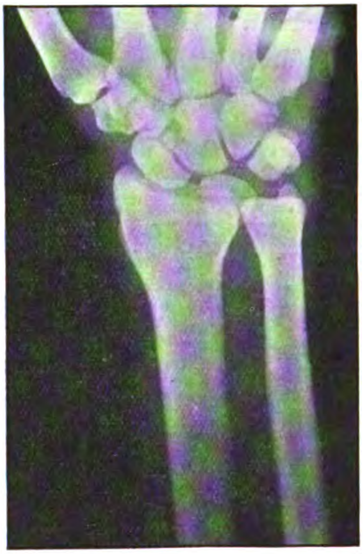
The third and last section of this valuable report deals with statistical tables for each Command, which cannot fail to be of interest to officers serving both at home and overseas, as they indicate clearly the diseases to be combated in order to improve the health of the Army.

Clinical and other Notes.

A CASE OF ANTERIOR DISLOCATION OF THE SEMILUNAR BONE.

By Major J. H. M. FROBISHER, B.S.
Royal Army Medical Corps.

A Naval rating was admitted to this hospital with the history of having fallen twelve feet on to his wrist. X-ray showed an anterior dislocation of the right semilunar. He had paresis of the median nerve and limitation of flexion of the wrist. The semilunar could be felt in front of the wrist-joint. Owing to the rarity of this condition I forward X-ray prints of the condition.



Antero-posterior

Antero-posterior right wrist after excision of semilunar.

The dislocated bone was removed by the anterior route with the almost immediate disappearance of the paresis and good restoration of function. I am indebted to Corpl. Baker, R.A.M.C., for the production of the excellent reductions of the original skiagrams.

SPONTANEOUS EXTRUSION OF A SALIVARY CALCULUS.

By Captain E. UNDERHILL.
Royal Army Medical Corps.

The patient, a private soldier, aged 23, reported sick on June 6, 1925, complaining of a sore throat of less than twelve hours' duration.

When first seen at 5 p.m. his condition, as described in notes which accompanied him to hospital, was as follows: "Left jaw and left side of neck swollen. Left tonsil tender and enlarged with a small white follicular patch visible. Difficulty in swallowing and speaking. Somewhat restless. Temperature 100° F. Pulse 90. A throat swab was taken and treatment as for a suspected case of diphtheria (serum, etc.) administered.

On admission to hospital, about 11 p.m. the same night, the most salient points in his condition were great restlessness and anxiety, and marked swelling of the tongue.

The patient was pale, extremely anxious and worried, very restless and continually spitting out a thin, watery, glairy fluid which trickled out of his mouth (in a fairly copious quantity in the aggregate) whenever he held his head down over a basin; unable to articulate properly and unable to give a coherent account of his symptoms. He seemed frightened of having his mouth examined.

There was great pain referred to the left side of the throat, and pain and difficulty in swallowing saliva.

The patient was unable to take nourishment by the mouth.

Externally diffuse swelling, which was very tender, was observed behind the angle of the left mandible. The patient shied away from attempts to feel it. Some degree of trismus was present.

The tongue was so swollen as to appear almost to fill the mouth, and obscuring the pharynx. It was almost immovable and intensely tender.

A whitish slough was seen in the floor of the mouth on the left side between the tongue and the gums, and extending antero-posteriorly for about an inch and a half. The patient resisted examination.

The left fauces were very swollen and inflamed, with marked œdema, and very tender. No membrane was detected, but a whitish exudate seen.

A view of the tonsils could not be obtained. Fœtor of the breath was noticed, but not marked. There was no dyspnœa. The pulse was good, full and steady. The next morning the patient was quieter, appeared less worried, but said he felt worse.

The swelling showing externally on the left side was slightly less, but possibly this was apparent only as compared with the right side where some swelling was now noted. There was less tenderness both externally and internally; otherwise the patient's condition was unchanged.

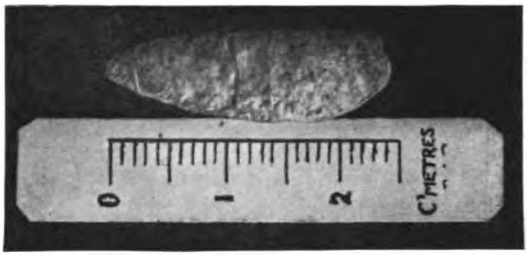
Bacteriological examination of throat swabs, both direct and, subsequently, after culture and incubation, revealed *Micrococcus catarrhalis* and staphylococci.

About noon the patient indicated that he felt something sticking into his tongue, and a foreign body, which on extraction was removed quite easily with a pair of forceps and had the appearance of a date stone, was found underneath the front of the tongue to the left side of the frænum, sticking into the tongue by one end, and apparently in process of extrusion. Subsequent to the removal of the concretion a small quantity of pus was spat out.

Within a few hours an amazing improvement in the patient's condition and comfort had occurred. The change was quite dramatic, and very obvious and marked.

Two days later (June 9, 1925) the swelling of the tongue had practically subsided; the tenderness had disappeared permitting free examination of the floor of the mouth.

The opening of the left Wharton's duct was widely patent, dirty and sloughy looking.



The plica-sublingualis appeared somewhat uneven and inflamed, and at the posterior end of it very small slight remains of whitish slough were seen.

There was nothing abnormal to be found in the right half of the mouth.

Absolutely nothing abnormal was found in the throat except slight congestion of the fauces, more noticeable on the left side.

There was no sign of recent inflammation of either tonsil.

Recovery was rapid and uninterrupted, the only signs remaining five days after the onset of symptoms being slight swelling still apparent externally and a few lymphatic glands just palpable, but not tender, below the horizontal ramus of the left jaw.

After removal of the stone treatment had consisted of mild antiseptic mouth washes.

A description of the stone, which has been sent to the Museum of the Royal Army Medical College, is as follows:—

General appearance and shape closely resembling those of a date stone: *Surface*: Rough but regular. *Colour*: Grey. *Texture*: Firm and hard, not crumbling, easily broken in two by fingers with clean fracture. *Length*: 25·40 millimetres (approximately one inch). *Breadth*: At broadest part nearer one end than the other 11·43 millimetres (nine-twentieths of an inch).

Weight: 192·9 grammes (12½ grains). On cross section shows concentric layers of deposit. Microscopical examination of a small scraping from the surface revealed an appearance resembling that of calcium salts.

The points of interest in this case would appear to be :—

(1) The entire absence of symptoms even in the presence of a good-sized stone which presumably must have been growing for some considerable time.

(2) The severity and rapid ingravescence of the symptoms when they did appear.

(3) The apparently grave condition of the patient—contra-indicated however by the state of the pulse—within a few hours of the onset of the symptoms (such a serious view of the case was taken that the patient was reported as "Seriously ill," and instruments for tracheotomy were kept in readiness by the patient's bedside).

(4) The extreme rapidity with which symptoms subsided after passage and removal of the stone.

I am indebted to Lieutenant-Colonel K. H. Reed, R.A.M.C., Officer Commanding, British Station Hospital, Kamptee, for permission to report this case and for suggestions in the preparation of the notes.

Travel.

JOTTINGS FROM A DIARY.

By Lieut.-Colonel C. R. L. Ronayne (Retired Pay).

Friday, December 7, 1923.—Left the Royal Albert Dock (London) about 8.30 a.m. yesterday. Light breeze from north. Unhappy and uncertain time from 11.30 p.m., blowing the fog-horn for four hours. When the fog cleared we narrowly escaped a collision with a German ship which held on and tried to cross our bow, though repeatedly warned by us. All day to-day a fresh gale blowing on our port quarter. Arrived off Dundee at 7 p.m. Rolled heavily whilst waiting and manœuvring for the pilot, as the weather at first was too bad for him to come out.

Tuesday, December 11.—Had a look round yesterday and to-day. Dundee is a fine town, but many parts are very hilly. The place is swarming with churches, also with jute, jam and chocolate factories. The two latter are quite close to the quays, and on Sunday crowds of young ladies with high heels climbed up our precipitous gangway. I am told it is the "recognized thing" for these jam and chocolate young ladies to inspect the neighbouring big ships on Sundays.

Many of them were very well dressed. All wore silk stockings—at least, I was told so. Went to the Museum to-day—small, but quite good. Amateur

photographers must be practically non-existent here, for I toured the whole town before I could find a shop with photo requisites; and when I did find one, could not get what I wanted.

There is a troublesome bar at the entrance to the Tay, and generally speaking the harbour is rather neglected, though capable of fine development. For example, each day at low water we take the ground; this is due to want of proper dredging, though I heard it said they are afraid to dredge lest the quay should fall into the river, and I think this is quite possible, as it is built of rickety old piles.

A winter's day on the Tees at Dundee. The Tees Bridge can be seen in the background.

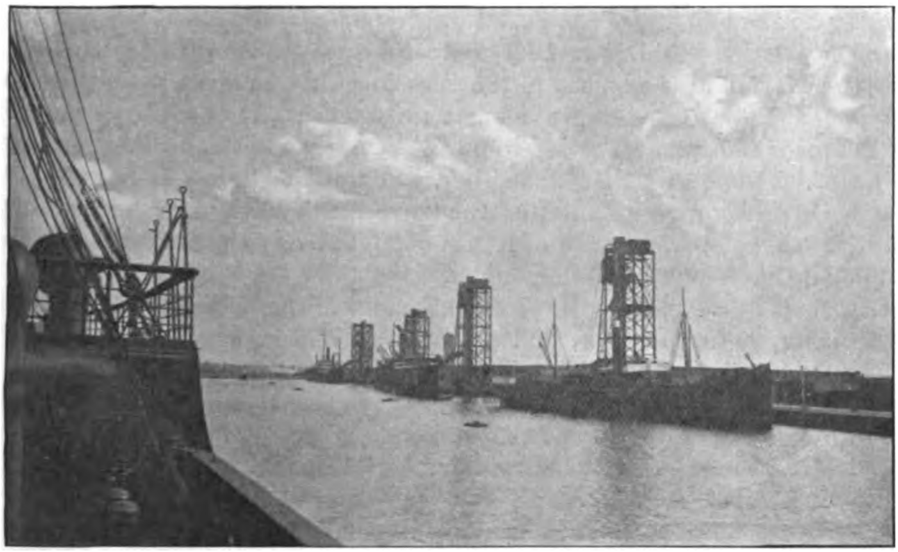
Wednesday, December 12.—Having discharged our 2,800 tons of jute, we cast off last night at 7 p.m. There was only a light wind and tide running, still the two wretched little tugs which came to manœuvre us could make no impression on us, and we had to re-moor, and did not get away until 2 a.m. this morning.

Thursday, December 13.—Moored in the Tees at 4 p.m. yesterday, and late at night entered the dock at Middlesbrough, and went to the "coal-tips" where we took in 1,700 tons of coal. I think I must write a book on coaling. As one voyages around from place to place one cannot help being struck by the great variety of methods, and by the ingenuity displayed in getting black diamonds on board, some showing ingenuity of a more or less simple kind, others the wonders of science as exemplified in modern engineering.

Who has been East who is not familiar with coaling at Port Said?

Primitive hand methods may be seen at Port Said, Durban, Singapore, etc. —but in every place there is some local difference. For instance, at Port Said coolies in a never-ending stream swarm up a plank, tip the coal from the baskets on their heads into the coal-bunker, and then return by a another plank; on the other hand at Moji, in Japan, nobody moves, but the baskets are passed rapidly from hand to hand by men standing in close formation.

On the Thames alone there are at least half a dozen methods in use. One of these, in the Royal Albert Dock, is to run little trucks on a sort of scenic railway which men quickly fit up on the deck. The trucks run gaily



View showing three of the coaling hoists in the Immingham Dock.

along the rails and tip themselves into the bunkers. The whole arrangement is ingenious and quite smartly done—and, moreover, there is no doubt about the " scenic " effect along the deck after the trucks have been running for some time, depositing little bits of " diamonds " here and there.

At Middlesbrough, Immingham, Colon, Newport News, etc., can be seen up-to-date methods—but even in these I have never seen two methods alike. That at Middlesbrough is roughly as follows: close to the quay is a cavity into which fits a large iron box. Over this box railway trucks pass, each containing 20 tons of coal, and as they pass a lever is pulled, the bottom of the truck collapses, and the coal is discharged into the box beneath. Towering over the whole for a considerable height is a great mass of steel girders containing complicated hydraulic machinery. As soon as three trucks have emptied themselves into the box, the box rises (in the middle of the steel girders) to a height of about 40 ft., then it tilts towards the ship, at the same time the side next the ship collapses, and the coal

is discharged into a shute, and thence into the ship's coal bunkers. This discharge takes place about every seven to ten minutes.

At Immingham each truck is lifted up in a steel tower.

Wednesday, December 19.—At Middlesbrough we discharged the 1,500 tons of manganese ore we had brought from Calcutta, and in addition to the coal, we shipped here 1,250 tons of cargo consisting mostly of steel girders and parts of machinery.

Left the dock at 2 p.m. to-day, but not before we had bent two of our davits on the port side by colliding with another ship. Though there was not much wind up the river, on approaching the mouth we found a strong and bitter northerly gale which had evidently been blowing for some time judging by the amount of sea on. For steepness, and general "nastiness" there is perhaps nothing to beat a weather-going tide off Portland Bill, still, the overfall at the mouth of the Tees this afternoon ran it pretty close. On a big ship, such as ours, it had not much effect, but a steamer of about 1,000 tons which was following in our wake fairly leaped and took it green on board. I thought, as I watched her, what an ideal place it would be to take a cinematograph picture, as the "overfall" was only a few hundred yards broad, and to the south of it was comparatively smooth water, where the handle could be turned in comfort.

As soon as we cleared the harbour's mouth the helm was put up, and then, being light in cargo, and getting the sea broadside on we rolled furiously.

Thursday, December 20.—A terrible night! I pitied the officers on the bridge, who must have been chilled through in the bitter gale and blinding snowstorms. We had to anchor, and so did not enter Immingham dock until 10 a.m. Though the tugs were powerful ones they could not handle us in the strong wind, and we collided with no less than three ships in the dock before we got mored up. I recorded how we had a collision yesterday at Middlesbrough—and now these three. From this it might appear the seamanship was not good; but the fact is both the Middlesbrough and Immingham docks are small and always crowded with ships, so it is almost impossible to manœuvre large ships if it is blowing at all strong; and then collisions are fairly common in spite of the best seamanship.

It is awe-inspiring to stand close to and watch a collision; the movements of the ships are generally slow, and if only the hulls come into contact nothing but a bit of bump happens. But though the movements are slow, the damage is often considerable if the upper structures first come in contact—and this fairly often happens. Then rails and stout stanchions twist and bend like so many slender hairpins, whilst there is a grinding, cracking and pulverizing of any wood about.

Friday, December 21.—The P. and O. ship "Perim" is lying close to us; she is already down to her Plimsoll-mark with steel girders for Japan, but there is no other ship in the dock, except at the "coal tips," and the

whole seven of these are working at full pressure, as they were when we were here four months ago; whilst outside the dock gates, anchored in the Humber, is a crowd of steamers awaiting their turn to come to the "tips." The coal trade is certainly humming here—as it was four months ago, from which it would seem all cannot yet be well in the Ruhr.

Christmas Eve, 1923.—Having shipped over 1,100 tons of steel, etc., at Immingham we left yesterday about 1.30 p.m. Had a strong northerly wind; made a good passage, and berthed to-day in the Royal Albert Dock about 1 p.m.

Saturday, December 29.—Loading of the ship has been more or less disorganized owing to the Christmas holidays, but by working night "shifts" for the past couple of nights the last of the cargo was on board by noon to-day when the passengers arrived by special train. Left the dock about 12.45 p.m.

Wednesday, January 2, 1924.—A gentle following balmy breeze across "the Bay" and down the Spanish coast has made the weather spring-like and delightful. This afternoon as we passed close to Cape St. Vincent, cameras were produced *en masse*, and the roar of the dark and deep blue ocean battering against the cliffs was augmented by salvoes of camera clicks. Whales around did their duty by showing their mighty heads and blowing high in the air for the entertainment of the passengers.

Thursday, January 3.—Passed Gibraltar. Why does everybody turn out to see it? This invariably happens—provided, of course, it is passed in the day time. In the well-deck aft are the stewards and stewardesses headed by the butcher with his apron, and the chef in his white cap—it always seems to be extra snowy for the occasion. For'ed, by the fo'castle, is the bosun with his crowd. Passengers are lined up on the deck to a man, with glasses glued to their eyes. Personally, though I have lived there for four years, and passed it many times, I always turn out and scrutinize everywhere with care. The place is certainly picturesque and somehow has a great fascination.

Sunday, January 6.—To-day we passed Malta. Sometimes we call in there; this time we did not. Like "Gib," it is also picturesque—though in quite a different way. It is curious the way the whole agricultural parts of the island, as well as the neighbouring island, Gozo, are terraced into little plots of land in seried steps one above the other. Curious also is the complete absence of trees; this might be thought to have a marring effect, but somehow it does not appear so to have, and the "terraces," the many towns and villages, the numerous churches with their graceful spires give a picturesque and pleasing effect. The Grand Harbour is very fine, and also picturesque, with its massive brown cut-stone fortifications of other days rising direct from the deep blue water and looking bold and stately. Indeed the fortifications, especially of the outer reaches, are so numerous the place would look rather aggressively bold were it not that in the background are many houses and villas, whilst at places whole

terraces of houses run right along the sea-front, thus toning down the grimness, but at the same time setting off the grandeur of the fortifications.

Talking of harbours reminds me that one of the finest harbours in the world lies neglected and practically unknown—I refer to Trincomalee in the North East of Ceylon. If it is not quite as fine as Bombay and Sydney harbours it runs them pretty close. It possesses a large outer harbour or bay, and a splendid inner harbour, with good anchorage, fine depth of water everywhere, and is sheltered on all sides. The entrance to the inner harbour has many fortifications, built apparently about thirty-five or forty years ago, but now all dismantled and in decay. The place abounds with delicious fish of all sorts, but they are all deep-sea fish, and I don't think there are any to be caught with a rod. The climate is cool—at least by comparison with Colombo.

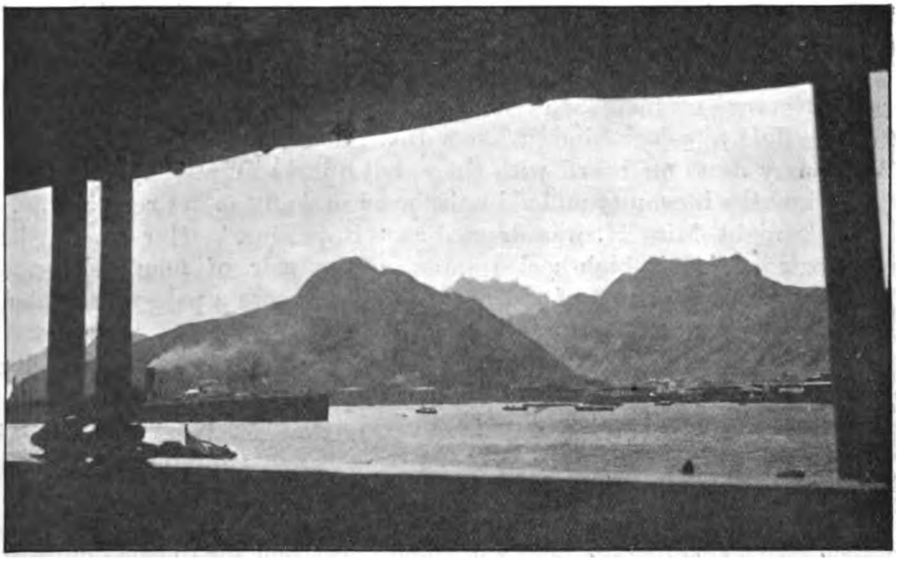
Off Malta it was coldish in the shade but delightful in the sun, and this afternoon I basked in it reading "Pepys' Diary."

Monday, January 7.—It was delightfully calm past Malta, and along the south of Sicily, but last night when we opened up the Adriatic we struck a fresh gale coming out through the Straits of Otranto and blowing right on our beam, with a nasty steep sea which caused us to roll a good bit, and we spent a pretty bad night rolling about in our bunks. But the sea is now calming down, and the return of the swallows reminds one of spring.

Wednesday, January 9.—Though the following does not form a part of my ordinary diary it may be worth recording: After lunch to-day an "ogwalla" or fireman was brought to me. His right patella was so perpendicularly on edge, and the tissues around so tightly-stretched it was quite impossible to say which way it should be pushed to reduce it—that is, to push in either direction might have meant an attempt to turn it inside out. On giving the proverbial "whiff" of chloroform, I expected it to go back readily with the proverbial "click." However, no such result! and in due course I sweated the proverbial "blood," but could not get it to budge a hairs-breadth, let alone an inch. By now there was, of course, no question of his not being "fully under," and the muscles should have been fully relaxed. During the manœuvres and manipulations the leg was kept fully extended and the thigh fully flexed. As a last resort, whilst keeping the leg extended and the thigh flexed I made another assistant interlock his hands just above the patella, and pull in a downward and backward direction—that is, in the direction of the heel. I was about to assist by manipulating the patella, but before I could touch it it went back with a click. I have consulted three textbooks on the subject, but none of them refers to any difficulty in reduction, and none mentions the above manœuvre, so perhaps it may be worth recording.

The exact kind of wrench or twist which caused the condition could not be ascertained; but according to the man's account, when coming out of a "donkey-boiler," he caught the leg between some pipes, and wrenching it free caused the dislocation. His legs are quite straight and normal.

Friday, January 11.—Arrived at Port Said yesterday 8 a.m. Fresh, cold wind from S.S.E. We entered the Canal about 2 p.m. Had two ties-up in the Canal, also one in lake Timsah, where we allowed two large passenger ships to pass us—an Orient boat and a Dutch mail. The effect in the lake was extraordinarily pretty; the full-moon light dancing on the waters; the lights of Ismailia twinkling in the background and the scenes of life and animation on the steamers around. There seemed to be a sort of competition amongst the three of us as to which should appear the gayest and smartest; our deck was gay with bunting and fairy lights, with dancing, music and singing going on. It was just the same on the other



Bird's-eye view of Aden, taken from the smoking-room of the "Novara."

ships; and the effect as they glided past, a blaze of lights, the full moon shining, and the twinkling lights of Ismailia in the background was picturesque in the extreme.

Left Suez at 6.30 a.m. this morning.

Wednesday, January 16.—We arrived last night at 10.30 p.m. at Aden and having disembarked Mr. and Mrs. I., of the E.T.C., and about 50 tons of general cargo, we left at 3 a.m. this morning.

Very few ships overtake and pass us at sea. It is not that we rank as an "ocean greyhound," still we have a turn of speed well above the average. Nobody likes to be overtaken and passed; the feeling is more or less one of humiliation. You somehow fancy you hear those on the other ship saying "Chuck us a rope, and we'll give you a tow." However, the mortification is somewhat ameliorated by the fact that the ships are usually at least a mile and often much more apart.

But yesterday morning the German ship "Essen" was evidently determined we should drink the cup of mortification to the dregs, as she overtook and passed us within a hundred yards—a most unusual thing out in the open sea. She was probably anxious that we should see her paint and brass work, and certainly she looked very smart and picturesque in her new paint and highly polished brass, of which she seemed to have rather an unusually liberal supply.

Wednesday, January 23.—We had a light and cooling N.E. monsoon across the Arabian Sea, and arrived at Colombo to-day at 4.15 p.m.

Last night the usual fancy dress ball before arrival at Colombo was held. Dancing on board is always popular, but the fancy dress dances always go with an especial swing. I am one of the first on board to know it's coming off. Several days beforehand miss so-and-so comes to me for wool as she wants to get up as "Snowdrop," another wants bandages, etc. A man wants tincture of iodine to colour himself like a babu; another wants Condy's fluid to colour himself like a Red Indian, and so on. Many bring their fancy dress on board with them, but quite a number make them on board, and the ingenuity and skill displayed in doing so are remarkable.

Last night Miss H. was dressed as "Boy Blue." Her kit consisted of a pair of lady's high-heeled shoes and a pair of men's socks. In her hair she had a tuft of red gauze, and she wore a pale-yellow blouse. Below this she wore white "shorts," which she had borrowed from one of the ship's officers. The "shorts" did not reach to within scarcely a foot of her knees, and they were very tight indeed.

But one sees such a great variety of kits at these fancy dress balls; I would not describe this one, only that it is of some interest as the good young lady who wore it is on her way to China as a lady missionary.

Shortly after arrival at Colombo I was busy in the surgery with the carpenter who had barked his shin, when I was sent for to come quickly to a young lady who was injured on the gangway. On hurrying up I found a knot of people surrounding three young ladies. One was lying on the deck apparently unconscious; another was alternately lifting the head of the unconscious one on to her lap and pushing it back on to the deck; another was tugging at her limbs and pushing her about in general.

At first sight I was thoroughly alarmed, as the whole setting gave the impression some horrible tragedy had occurred. But I soon found out there was nothing the matter with the fair one, as she had merely given herself a trivial knock. The whole three of them were in the throes of hysteria, but after a little suitable treatment they were within a short time once again walking gaily down the gangway to go ashore.

Curiously enough only last night I was reading a panegyric by one of our "home" professors showing how, since we have granted the "greater freedom" to women, there has been a complete disappearance of anæmia, screaming at the sight of a mouse, fainting, collapse and hysteria.

(To be continued.)

Current Literature.

MEDICAL RESEARCH COUNCIL. Spec. Rep. Ser. No. 98. **Studies of the Viruses of Vaccinia and Variola** [GORDON, M. H.] 135 pp. 5 pls. 1925. London: H.M.S.O. [3s. 6d.]

This report records the results which Dr. Gordon has obtained in a study of the virus of Vaccinia. The introduction contains a thorough review of the literature.

The author has re-tested a large part of the recorded data with regard to the behaviour of this particular virus, and has added important facts as the result of his own experiments. The occurrence of several outbreaks of smallpox in this country, both of the mild type (Alastrim) and of the confluent type, enabled him to compare the virus obtained from these sources with that present in calf-lymph.

Omitting all details of technique, which include useful and important modifications of the methods hitherto employed, but for which reference must be made to the report itself, his results support the following conclusions:—

The intracutaneous inoculation of calf-lymph produces typical lesions in the rabbit, which may be propagated in series. The material from these lesions, on inoculation into other rabbits by various routes, will lead to the formation of antibodies, which may be supposed to be specific against the virus itself, since the other constituents are drawn from rabbit-tissue.

The virus is particulate, as may be shown by the effect of gravity, or of centrifugation. The effect of different disinfectants on this virus varies over a wide range, potassium permanganate being peculiarly active and exerting a marked virulicidal effect in dilutions of 1/100,000 or over. The virus is inactivated by heating at 55° C. for one hour. Exposure to this temperature for thirty minutes deprives the virus of the greater part but not always of the whole of its activity. The different specimens of calf-lymph in use in this country vary very widely in their virulence, as tested upon the rabbit. Some are active at a dilution of 1/100,000; one specimen was inactive when diluted about 1/10.

In addition to the active immunity produced by the intracutaneous inoculation of the virus in rabbits, a high degree of immunity may be produced by the subcutaneous inoculation of either raw virus, or of virus heated at 55° C. for thirty minutes, though the raw virus appears to be definitely more active. [It would appear also that the preliminary heating did not suffice to kill the virus in all the experiments recorded.] The immunity so afforded appears on about the fourth day, becomes complete about the tenth day, lasts for fifty days at least, and becomes incomplete by the hundredth day.

Rabbits so treated develop antibodies to the vaccinia virus, which can be demonstrated by the complement-fixation test or by agglutination. Such sera will protect rabbits against the intracutaneous inoculation of the virus.

The vaccinia virus will penetrate certain intact mucous surfaces of the rabbit—the nasal mucosa, the conjunctiva, or the lining membrane of the external auditory meatus—but will not penetrate others, such as those of the mouth, vagina or rectum. The nasal mucosa appears to be the most permeable, and the application of virus to this surface is followed by a well-marked active immunity. Following such applications rabbits develop a nasal discharge, containing active virus in large amounts. In control experiments it was shown that the nasal mucosa of the rabbit is also permeable to killed Bact. coli, since the application of such suspensions was followed by the appearance of agglutinins in the blood.

The serum of a rabbit immunized against vaccinia virus gives complement fixation and agglutination reactions with this virus, and with the virus obtained from the lesions of mild or of confluent smallpox, but not with the virus of varicella. These reactions may be made use of for the diagnosis of a doubtful eruption.

The viruses obtained from mild or confluent smallpox produce typical lesions in the monkey but not in the rabbit. The vaccinia virus protects the monkey against the virus of variola, but neither the virus from mild nor from confluent smallpox affords complete protection to this animal against the virus of vaccinia.

This report will be indispensable to any investigator who desires to study the infections with which it is concerned.

W. W. C. Topley.

Reprinted from "Bulletin of Hygiene," Vol. 1, No. 1.

O'Brien, R. A. **Active and Passive Immunisation against Common Infectious Diseases.** *J. Roy. San. Inst.* 1925, v. 46, 101-6.

In this short but admirable review the author summarizes the data at present available with regard to active and passive immunization against certain infectious diseases in man. Dealing first with diphtheria and scarlet fever, he reviews the results obtained in this country by the application of methods based on recent advances in our knowledge of immunity reactions in these diseases. To the study of these methods Dr. O'Brien and his colleagues have themselves contributed largely, and his paper includes the results of a considerable series of personal observations.

[It is well known that the introduction of the Schick test, in which a small amount of diphtheria toxin is inoculated intradermally, enables us to differentiate those individuals who are susceptible to the action of this toxin, and therefore react positively, from those who are resistant, owing to the presence of antitoxin in their blood, and so react negatively. Having differentiated in this way between susceptibles and immunes, we may immunize the former by the injection of graded doses of toxin and antitoxin,

a method which has the enormous advantage over the use of antitoxin alone, that the immunity lasts for many years instead of for a few weeks.]

Having observed the application of this method in four large institutions, over a period of four years, the author reports the following results : In the immunization of about 1,000, out of a total of about 3,000 individuals, no harm has resulted in any instance. In three of the four institutions diphtheria has almost entirely disappeared since immunization has been practised. In the fourth institution there is a settled population of about 600, who are kept immunized, and a floating population in and out of hospital, who are not immunized. During the period of observation forty-five cases of diphtheria have been notified among the latter, while no case of clinical diphtheria has occurred among the former.

The experience of the author and his colleagues over a number of years agrees, as regards the reliability of the Schick test, with that of PARK and ZINGHER in America. No clear case of clinical diphtheria has been noted in an individual whose Schick reaction was certainly negative. A small number of negative factors have been found to be harbouring virulent diphtheria bacilli while suffering from mild sore-throat. Whether these are to be regarded as mild cases of diphtheria in partially immune subjects, or as diphtheria carriers suffering from mild tonsillitis, is a question that cannot at present be answered.

There is, in any case, ample evidence that by taking advantage of these methods, an outbreak of diphtheria in a school or other institution may rapidly be brought under control. All inmates are Schick-tested and swabs are taken from their throats, those cultures which show morphologically typical diphtheria bacilli being tested for virulence. The Schick-positive reactors, *i.e.*, the susceptibles, are immunized. The Schick-negative and swab-positive individuals, *i.e.*, the immune carriers of virulent diphtheria bacilli, are isolated.

The use of the Dick test, and immunization with the toxin of the Streptococcus scarlatinæ, are next considered. It is concluded that the results obtained are extremely promising, although, as regards the intradermal test, they do not appear to be so clear as in the Schick reaction.

The author then refers to certain of those diseases in which an ignorance of the causative organism prevents us employing any method of immunization based on the use of bacteria or their products. He points out that, even under these conditions, we are not condemned to complete inactivity. In the case of measles it is possible to use the serum of convalescents either for the treatment of the disease, or for the protection of children who have been exposed to infection. Attempts have been made at active immunization using the nasal secretion of cases of the disease and carrying out the immunization during the early months of life, when an infant is usually protected against a severe attack of the disease by the possession of residual antibacterial or antitoxic substances from the maternal blood.

Similarly in mumps, whooping cough and varicella, the serum of convalescents has been employed for prophylaxis, with apparent success.

W. W. C. Topley.

Reprinted from "Bulletin of Hygiene," Vol. 1, No. 1.

Pawan, J. L. **A New Medium for the Differentiation of *B. coli* in Water Analysis.** *Ann. Trop. Med. & Parasit.* 1925, v. 19, 319-26. [9 refs.]

There is a considerable mass of evidence indicating that the data on which it is customary to base bacteriological reports on samples of water in this country are not applicable to tropical water-supplies. It is generally admitted that the criteria usually employed for diagnosing an organism as *B. coli*, from the point of view of the sanitarian, lead to the inclusion in this group of a number of different species. Certain of these species are almost certainly not of fæcal origin, and their presence is, therefore, not significant evidence of fæcal pollution. It seems probable that such species do not occur with any frequency in the water-supplies of large cities in this country; so that their inclusion in the category of *B. coli* does not lead to any substantial error. There is, however, no *a priori* reason why the relative frequency of the various species within this group should be the same in tropical as in temperate climates, and experience would appear to indicate that it is not so. The author points out that, in the Tropics, the actual results of bacteriological analysis as compared with the evidence obtained by sanitary surveys strongly suggests that the application of the usual tests for *B. coli* may be grossly misleading.

The author reviews the literature dealing with the differentiation of the *B. coli* group into those species whose natural habitat is the intestine of man and animals, and those species which appear to live in soil or in grain, and pays particular attention to the methyl-red and Voges-Proskauer tests, and the test recently introduced by Koser, which depends upon the ability or inability of the different species to utilize sodium citrate as a source of carbon. As the result of numerous investigations it has been very generally accepted that the true *B. coli* produces a degree of acidity in a dextrose medium which causes a red coloration in the presence of methyl-red, *i.e.*, is methyl-red positive, but fails to give the Voges-Proskauer reaction. The species which is a common habitat of the soil, the *B. aerogenes*, reacts negatively to methyl-red, but gives a positive Voges-Proskauer reaction. Koser found a high correlation between the production of a positive reaction to methyl-red and the inability to utilize sodium or potassium citrate. This correlation, however, was by no means complete when strains from unpolluted soil were examined. Among seventy-two such cultures 97·2 per cent utilized the citrate, while only 51·4 per cent were methyl-red negative, and 52·8 per cent Voges-Proskauer positive. It might seem, therefore, that the ability to utilize citrate is a

better test of the non-fæcal origin of a given strain of *B. coli* than is a negative methyl-red test or a positive Voges-Proskauer reaction, and this is the position which the author definitely adopts.

[The foundations of this belief do not, however, appear to be very firm in the light of the evidence at present available. The differentiation between *B. coli* and *B. aerogenes* on the basis of the methyl-red and Voges-Proskauer tests is founded on far more adequate data than is the differentiation between fæcal and non-fæcal strains on the basis of the Koser test.] The author's own experience in Trinidad is entirely in agreement with the former differential criteria. Of 740 cultures of coliform organisms from human, bovine and equine fæces he found 94 per cent to be methyl-red positive and Voges-Proskauer negative. Of 120 cultures from unpolluted soil he found 85 per cent to be methyl-red negative. This would appear to be fairly satisfactory evidence of the differential value of these tests. Dealing, however, with water, divided into two groups on the evidence of a sanitary survey, he found that of 220 strains from polluted water 87·3 per cent were methyl-red positive and 6·4 per cent doubtful, while of 240 strains isolated from sanitarily pure water 42·5 per cent were methyl-red positive. While, therefore, the strains regarded as *B. coli* on the usual criteria (Lactose+ Indol+) were reduced by over half in the case of the water regarded as unpolluted, there remained a considerable residuum in which the bacteriological results still failed to square with the results of the sanitary survey. When reliance was placed on the Koser test, however, 81·3 per cent of 240 strains from unpolluted waters utilized the citrate, and were thus judged to be non-fæcal in origin. It is clear, therefore, that the Koser test gave better agreement with the results of the sanitary survey, and that insistence on the methyl-red test would have left an additional 20 per cent of the strains about which the bacteriologist and the sanitary surveyor would still have failed to agree. [Some may feel that, in the present state of our knowledge, it would be safer to trust to the very considerable mass of evidence which correlates a positive methyl-red test with a fæcal habitat, and to regard these 20 per cent of strains with considerable suspicion.

With regard to the author's main contention, that the criteria usually adopted for the diagnosis of *B. coli* in this country fail under tropical conditions, and that the additional tests which are now available should be employed, his case must be regarded as proven. There would indeed, seem to be every reason for adopting these tests in all bacteriological examinations of water. There is nothing to be gained by the deliberate neglect of scientific knowledge in routine bacteriology.

W. W. C. Topley.

Reprinted from "Bulletin of Hygiene," Vol. 1, No. 1.

Reviews.

THE HOUSE-SURGEON'S VADE-MECUM. By Russell Howard, C.B.E., M.B., M.S.Lond., F.R.C.S., and Allan Perry, M.B., M.S.Lond., F.R.C.S. Second Edition. Revised and Enlarged. London: Arnold and Co. 1926. Pp. viii + 520. With 159 figures in text. Price 12s. 6d. net.

The first edition of this useful little book was published in 1911. The second edition has been written in response to numerous requests. Both authors are on the staff of the London Hospital, the one as surgeon and the other as assistant surgeon; Mr. Russell Howard is also senior surgeon of the Poplar Hospital. These facts and the fact that in the new edition the authors have endeavoured to incorporate the most modern methods in use in surgical wards are sufficient guarantee of the practical value of the book. The whole field of first aid and minor surgery is covered, and the chapters, of which there are twenty-four, also include emergency operations and the preparatory, after-treatment and complications of operations on different parts of the body. The earlier chapters are of a general nature and deal with aseptic surgery, the sterilization of the hands, skin, operating-room instruments and so on, the symptoms and treatment of poisoning from antiseptics, such as mercury compounds, iodoform and carbolic acid; shock and asphyxia; hæmorrhage and acute surgical infections. These are followed by chapters on local surgical operations, fractures, bandaging, medico-legal notes and anæsthetics; and conclude with an appendix on the preparation of museum specimens, laboratory preparations, serums and antiserums, the diagnostic and therapeutic uses of tuberculin, and the use of Coley's fluid. The whole achieves in a pre-eminent degree the purpose for which the book was written. It is not only a vade-mecum for recently appointed house surgeons and dressers, but is also a handy practical guide for members of the medical profession engaged in general practice, especially for those who have not had the advantage of holding a house-surgeon's post in a large hospital. Needless to say that in these circumstances it is equally useful as a handy pocket book—if one may use the expression for a book that is larger than the usual pocket book but not too large—for officers of the Royal Army Medical Corps. The print is clear, with subsidiary headings in bold letters, the illustrations are well drawn and not too complicated; there is a good index, and the price is moderate. It is a vade-mecum that we can thoroughly recommend. It should prove of special value to officers in out-stations and on service overseas.

A SHORT HISTORY OF THE BRITISH ARMY TO 1914. By Captain Eric W. Sheppard, Royal Tank Corps. London: Constable and Co. 1926. Pp. xiii + 314 with 18 maps. Price 14s. net.

The title of Captain Sheppard's book is somewhat misleading, and the reader, who expects to find in it a history of the evolution of the equipment, dress, organization and administration of the Army and its regiments and corps from the earliest times, will be disappointed, probably agreeably so; for the book contains nothing of the sort, and is in fact not a history of the army in that sense, but of the campaigns, and indeed of every campaign great and small, in which British troops took part. The author tells us that he was induced to write it because he found to his surprise that no such thing as a short history, which he required for professional purposes —presumably examinations—could now be purchased except through secondhand booksellers, and that such works as were procurable were by no means up to date. There are, of course, several books which deal with the British Army and its history, such as the official Army Book of the British Army and General Anderson's "Notes on the Development of the British Army to 1914," and others of earlier date, not to mention Fortescue's monumental work, as yet incomplete. But what Captain Sheppard gives us is something different. He endeavours to condense into a series of comparatively short chapters a clear and critical account of each campaign or period of campaigns, setting forth the causes, political and otherwise, progress and results of each military operation, interlarded here and there with picturesque reconstructions of some of the battles, such as Oudenarde and a battle in the time of Wellington. The two opening chapters deal with a general review of British military history and of the beginnings of the British Army from the year 55 B.C. to A.D. 1660, when the maintenance of a permanent armed force was first sanctioned by Parliament. The succeeding chapters are pleasantly written and present interesting accounts of some of the essential historical facts connected with the wars of the seventeenth, eighteenth and nineteenth centuries in Europe and overseas, and of the South African War and minor wars of the present century. In an epilogue the author, after coming to the conclusion that not only in military but in all history the development of cause and effect is gradual, and that a sudden and complete break with the past is seldom if ever met with, leaves it to the reader to answer for himself how far the advent of new inventions on land, sea and air will make the guidance of history, hitherto regarded as inevitably repeating itself, dubious and misleading. Unfortunately he makes very little reference, and then only a passing reference, to the influence of health conditions on campaigns, and no reference whatever to the medical services, beyond a short note on the influence of public opinion and of Florence Nightingale in urging the medical authorities to purge and remodel the hospitals at Scutari during the Crimean war. There can be no doubt that military history will repeat itself in a medical sense, unless a well organized and efficient medical

service is maintained, irrespective of the advent of new inventions. We can recommend the book to officers of the R.A.M.C. if only as a framework into which may be fitted details of the medical aspects of British campaigns, the lessons of which cannot well be learnt without taking these into consideration.

SOME TALK OF ALEXANDER. By James Bridie. London: Methuen and Co. 1926. 8vo. Pp. xii + 180. With a map. Price 6s. net.

This book with the fanciful title purports to be an odyssey or an anabasis, or both, of a medical officer during the war, although the name of the author is not to be found in the Medical Register. He describes in fantastic style how he went from Fort George to Plymouth, and from there to Bombay by way of the Cape for fear of submarines. From Bombay, after a trip up country, he proceeded to Mesopotamia, and eventually served with Thompson's Force in Kurdistan, Persia and Baku. Part of the book, he tells us, was written for fun, but why the other part was written he has no idea. On the whole it is an amusing book, interspersed with some good and some bad poetry, and with philosophical dissertations, intended to be humorous, on various subjects, such as Angostura and gin. Indeed, drink of all kinds and in various places enters largely into the picture of the author's travels and experiences. He did not like Cape Town. All the public houses were shut, and the citizens were "depressed and awestruck by a galley full of strange, wild and adventurous Australians." Durban, on the other hand, was "the kind city." It entertained and delighted in honouring "anything in khaki." On the voyage the author shared a cabin with a regular R.A.M.C. officer, to whom he gives the camouflaged name of Ambrose, who may possibly be identified, however, as he is described as a saturnine man, with large feet, a small head, and sensitive-looking nostrils, and went out East in 1917. But it will defy imagination to picture the budding psycho-analytic specialist in Mesopotamia, "who had hair like newly-painted cart wheels, a back like an ox, and a face like a ham"; still less to picture the male member of the Baku opera chorus, who had "a face like the petticoat of Beelzebub's wife."

These are only one or two instances of the author's fantastic style and descriptions. The reader who struggles through its pages may possibly find the book as a whole dull, and its humour forced and ponderous, but he will be enlivened by some decidedly amusing and entertaining chapters descriptive of incidents in Persia and Baku, notably the chapters on "Pax Britannica," "Theodorus and Isabella," and "The Waiters." There is a mysterious old woman in the opening and penultimate chapters, but the object of introducing her is not quite evident.

On the title-page the book is described as a "Revue with interludes in the antique mode." The interludes are some lines in blank verse descrip-

tive of scenes and journeyings. The map is intended to explain the latter. It is the only "antique mode" we can discover and is like nothing on earth!

A Practical Handbook on Rat Destruction. By C. Leopold Claremont, B.Sc., F.I.C. London: John Hart. 1926. Pp. 190. With 5 plates and 3 figures. Price 3s. 6d. net.

Few of us realize the economic importance of rat destruction, although rat destruction as a measure of disease prevention is common knowledge; and when we read in the introduction to this small volume on the subject, that the rat population is probably equal to the number of human beings in a community, and that each rat eats about £1 worth of food per annum, irrespective of the damage done in fouling food, gnawing woodwork, etc., we are appalled at the cost of maintaining a rat population in the country. A conservative estimate for Great Britain is £42,000,000 annually. In the United States the loss is estimated at 200,000,000 dollars; and in India the total cost of the rat, including losses due to plague, has been estimated at £828,000,000 over a period of twenty years. Another estimate is to the effect that 100 rats might eat in six months enough grain to provide 2,000 quartern loaves; or two billion loaves annually on a rat population of 50,000,000. At 9½d. a loaf this is equivalent to a loss of £80,000,000. The author, who was recently Research Chemist in charge of the Rat Research Department of the Ministry of Agriculture, produces these figures in order to bring home to the farming community the enormous potential loss involved in neglecting to protect corn-stacks and granaries from rats. Apart, then, from its importance as a preventive of certain diseases rat destruction is, so far as Western countries are concerned, a waste problem; and it is from this point of view that the book has been written. It details the various methods of protecting buildings, of rat catching, trapping and destruction by gases. A considerable section is devoted to the subject of rat poisons and how to use them, and to co-operation in rat destruction under the Rats and Mice (Destruction) Act of 1919. A short chapter refers to diseases transmitted by rats; and in a final chapter the author speculates on how far the rat menace may in time be brought under control, in the same way that malaria has been brought under control by mosquito campaigns. One note of warning, however, is sounded. Is the complete extermination of rats desirable? If this did take place, would the balance of nature be upset in some other direction, possibly by making room for vastly greater numbers of mice and voles?

The volume as a whole is a useful little treatise on rats and their destruction; it contains an appendix of formulæ of rat baits, and an index; and is essentially practical in character. It will be of value to medical services engaged in the work of plague prevention and other diseases transmitted by the agency of rats.

AN INDEX OF TREATMENT. Edited by Robert Hutchison, M.D., F.R.C.P., and James Sherren, C.B.E., F.R.C.S. Bristol: John Wright and Sons, Ltd. London: Simpkin Marshall, Hamilton, Kent and Co., Ltd. Pp. xviii + 1035. Price 42s.

A book such as "An Index of Treatment" is of the greatest value to medical men, for it enables them to keep in touch with the details of the great contest which is being ceaselessly waged against disease.

Every year sees some fresh knowledge gained, while new and improved methods of treatment are continually being discovered.

A great stream of medical publications is available, but no one engaged in active daily practice can hope to read more than a small portion of this literature.

The "Index of Treatment" provides in one volume a complete up-to-date description of the most recent and successful forms of medical treatment. Nearly one hundred contributors, well known as experts and authorities in the medical profession, have given the fruits of their experience and knowledge to make this work a standard and reliable reference book.

That so great an amount of information should have been compressed into one book is a remarkable achievement, and is a fine example of clear and condensed descriptive power.

The alphabetical arrangement of the book makes it very convenient for reference purposes, and in addition there is a supplementary index at the end of the volume.

In its application the book covers the whole field of medical treatment, and in a review it is not possible to refer to more than a very small part of its contents.

There are certain diseases for which the best methods of treatment are still in doubt, and the ordinary medical man takes a special interest in them. "The Index of Treatment" presents the principal views held in the profession with regard to the treatment of these cases, and the reader is thus able to form his own judgment as to the best course of action to take in the particular case he may have to treat.

The article on "Fractures," to mention a subject in which different schools of thought exist in the profession, deals very fully with the problem of treatment. The various methods advocated are well presented and the clear illustrations will be found most helpful to those seeking guidance in this subject.

The subject of blood transfusion is dealt with in a thoroughly practical way, and the diagrams showing the exact technique of the procedure will be of great assistance to medical men.

Heliotherapy, which has exerted a marked influence on recent medical thought, is well described, and the various forms of light treatment together with the methods of their application are full of interest to the profession.

A close study of the article on specific therapy will enable the practitioner to realize the large number of infections which can now be combated by some form of bacteriotherapy.

In radiotherapeutics and radium therapy the medical profession possesses new powers to cure and arrest disease, which are as yet only partly known.

The numerous successes already won in the struggle with malignant disease by the use of X-rays and radium are described, with very interesting details in connexion with the methods of application recommended for various cases.

Treatment by radiation is of great interest to all medical men, and anyone desirous of knowing the present-day opinions regarding the treatment of disease by X-rays and radium will read the corresponding articles of this book with close attention. C. C.

THE EARLY DIAGNOSIS OF THE ACUTE ABDOMEN. By Zachary Cope, B.A., M.D., M.S.Lond., F.R.C.S.Eng. Oxford University Press: Humphrey Milford. Pp. xiv and 233. Price 10s. 6d.

The first chapter of this book, which deals solely with the question of diagnosis, gives the author's views as to the correct way in which these important cases should be examined. He points out that the key to success in the treatment of acute abdominal conditions lies in the early diagnosis of the case.

The necessity of the early examination being as thorough and complete as the circumstances permit, is not always recognized, and the author warns his readers against the danger of a superficial or incomplete preliminary examination of the case, followed by a period of temporizing, in which valuable time may be lost.

After the initial shock in many acute abdominal cases there is a short period of reaction, during which the patient may both feel and appear to be better. This period of reaction after the primary shock tends to mask the real gravity of the underlying condition, but if the medical man in charge of the case has made a thorough examination of the patient in the first instance, he is not likely to be deceived by this apparent improvement.

The importance of an accurate anatomical knowledge on the part of the observer, if he is to interpret correctly the various symptoms and signs presented by the patient, cannot be exaggerated, and the excellent diagrammatic illustrations of this volume make the author's descriptions very clear.

The second chapter of the book describes in detail the routine examination of an acute abdominal case according to Mr. Zachary Cope's method.

A very complete printed form is used which covers both the history and present condition of the patient. The completion of this form necessitates the most thorough examination of the patient, and prevents any essential feature of the case being accidentally overlooked.

The author takes each of the common symptoms and signs of acute

abdominal disease and explains in detail the anatomical and physiological reasons for their occurrence.

The various acute abdominal conditions are dealt with in separate chapters, and a special chapter is given to the differential diagnosis of appendicitis.

Each of the various acute abdominal conditions is very thoroughly described, and the essential points in each type of case, which will enable the medical man to arrive at an accurate diagnosis of the condition, are very clearly presented to the reader.

Special chapters devoted to "The Acute Abdomen in the Tropics," and also to "The Early Diagnosis of Abdominal Injuries," are full of interest, while the essentially practical arrangement of this book makes it a very valuable guide to medical practitioners in this important branch of surgery.

C. C.

A TEXT BOOK OF PATHOLOGY, GENERAL AND SPECIAL. By J. Martin Beattie and W. Carnegie Dickson. London: Published by William Heinemann (Medical Books), Ltd. 1925. Third Edition. Pp. 1103. Illustrations 499 and 17. Coloured plates from original preparations.

This book was first published as a "General Pathology" in 1908, and was based on the teaching of the Edinburgh School. A "Special Pathology", a companion volume to the "General," was first published in March, 1909. This the third edition combines the "General" and "Special" Pathology in one volume, which amongst other advantages, has reduced the price from 3 guineas for the two volumes to 2 guineas for the present one volume. Both authors served in the Royal Army Medical Corps during the war, and they have made use of the experience gained by themselves and others during a period which greatly increased the knowledge of pathologists and of the medical world generally.

The book is written for the student and medical practitioner rather than as a work of reference for the research worker in pathology. For this reason probably the authors have not considered a bibliography necessary though references have been given to some of the more important papers. We regret this omission; a good bibliography stimulates research, and it is to the young and active mind of the University student that this stimulus is so important. For the same reason no doubt, the physical, colloidal and biochemical aspects of pathology are not enlarged upon, but on such study the knowledge of all normal as well as pathological changes in the life history of the cell is based; at the present day this study is still in its infancy and the authors have therefore probably deemed it unwise to indulge in premature speculations. It is most unwise to prophesy, but the reviewer feels that the textbook on pathology of some fifty years hence will be a vastly different book from those of the present day. Biochemistry and what may be termed bio-electricity will have come into their own, and many a problem at present obscure in medicine and pathology will have been elucidated.

Like the modern treatise of medicine, the future textbook of pathology will be a compilation in which the physiologist, the biochemist, the pathologist and the protozoologist will each have his part, and, working in close partnership will present to us a logical and comprehensible whole. We must get back to the team work which was productive of such valuable results during the war. The subject is too vast and too intricate, and the dependence of one branch on the others too close for water-tight compartments. We have the workers and the knowledge, but alas! we still have the water-tight compartments.

It is for this reason the reviewer likes the author's quotation on p. 2, from Doncaster's, "An Introduction to the Study of Cytology," p. 3, 1920. "It is more profitable to regard the organism as the individual, with a common life running through it all, and the cells not as units of which it is built up, but rather as parts into which it is divided in order to provide for the necessary division of labour involved in so complete a process as life. The conception of the cell thus remains, but no longer requires or is capable of the strict definition that was needed when the word was supposed to represent a fundamental biological entity."

The study of physics and biochemistry of the cells will explain to us why and how and where this "necessary division of labour" takes place, and it will prove, if such proof is at all necessary nowadays, how interdependent the cells of the Metazoa are, on one another, how the failure of one group brings the downfall of another in the same way, as the failure of one department in a business may bring about the destruction of the firm itself. At present in a textbook of pathology one feels one is dealing with the symptoms of this failure, not with the failure itself; we are noting the gross lesions and tending to overlook the minute and primary biological and biochemical changes which lead to those gross lesions.

This textbook will no doubt find a place in the library of many a Royal Army Medical Corps hospital. The work is distinguished by the lucidity of its writing, the clearness of the letterpress, and the excellence of its paper and production generally. The writer has read reviews in which the weight and size of the book have been condemned. Its weight is some 2,500 grammes (5 pounds 5 ounces), it is therefore heavy, but the artistry of its production would in our opinion have been spoiled, had thinner paper and cheaper means been employed.

In a book of such well-known merit, it is difficult to discriminate, but for chapters which will appeal to R.A.M. Corps officers, more especially one would note those on blood (diseases of the blood and blood-forming organs), and on immunity and fever.

The section on Animal Parasites and Protozoa (100 pages, pp. 349 to 450), unusually long for a textbook on pathology, will also be of interest to officers of the Corps.

The information is in a very condensed form in parts of this section, notably in Class II, Mastigophora, Leishmania and Spirochæta, and in

these instances the information is not up to date. For instance, something more recent than a reference to a work dated 1907 might have been made at the foot of p. 363, where it is stated that, "Work . . . seems to point to the bed bug as an agent of infection," when speaking of the infective agent in kala-azar. The work of Knowles and Napier in 1924 showing that *Leishmania donovani* passes into the flagellate stage in the gut of the sandfly *Phlebotomus argentipes* under suitable conditions, has been overlooked, as has the work of H. E. Meleney on "The Histopathology of Kala-azar in the Hamster, Monkey and Man."

It is obviously difficult to deal with protozoology in detail in a textbook of pathology, but such statements as are made should be obtained from the most recent papers and works on the subject.

The chapter on the "Ætiology of Tumours in General," pp. 263 to 276, gives a résumé of the known factors which have a bearing on neoplasms in general and a brief account of the various theories which have been put forward to account for these new growths. The work of Dr. Peyton Rous, of the Rockefeller Institute, in 1911, is not quoted though surely this astonishing observation of Rous was an extremely original advance in the ætiology of cancer, and came in advance of Fibiger's work (1913) which is referred to.

The chapter was obviously written before the publication in July, 1925, of the work of Dr. W. E. Gye and Mr. J. E. Barnard, as no reference is made to work which is as extraordinary and original as that of Dr. Rous, and which brings forward a new view on the ætiology of cancer which is as brilliant as it is original.

We cannot close this review without a special word of commendation for the coloured plates of Mr. Richard Muir, of the Pathological Department of Edinburgh University. There is a numerous collection of photomicrographs, but these do not come up to the standard of the coloured plates, the details in some are rather indistinct, as if the focusing had not been perfect or the plates old.

Lastly, the proof reading has been excellent and the index carefully compiled.

H. R. B.

Reports and Analyses.

"PANTOSEPT" DISINFECTANT.

THE samples examined were put up in cardboard cartons labelled "D.R.P. 318899 25g. Pantosept nach Prof. Dr. Claasz. Pantosept G.m, b.H. Chemische Fabrik, Ulm—Ehrenstein—" etc.

The preparation is marketed in England by the Barton Trading Co., Ltd., Dean Stanley Street, Westminster, S.W.1. It is a white powder, free from odour, easily soluble in water, yielding a solution neutral to litmus, clear and colourless. The solution gave positive tests for hypochlorous acid.

In composition it appeared to be sodium salt of Dakin and Dunham's "halazone," on which there is a report in the *British Medical Journal*, 1917, vol. I, p. 682, and whereas halazone was not easily soluble in water, this compound dissolved rapidly.

The available chlorine in the substance amounted to 13·5 per cent. Its Rideal Walker Coefficient was one, that is, it is as efficient a disinfectant as phenol, killing *Bacillus typhosus* in ten minutes, using a one in one hundred solution.

Added to water containing an aqueous emulsion of *Bacillus coli* at a dosage of one gramme for every ten gallons, the free chlorine in the resultant water titrated to three parts per million, and the substance appeared to be an efficient sterilizer.

Keeping Properties.—Another packet was preserved at 37° C. for four months. The powder caked and the chlorine content amounted to 14·4 per cent, showing that the substance will not be likely to decompose when stored in a tropical climate.

Sterilizing.—A one per cent solution autoclaved in the usual manner for half an hour had its chlorine content lowered from 14·4 per cent to 13·5 per cent calculated on the original substance, a barely appreciable loss.

Pantosept is also put up in neat tabloids for convenience in preparing the correct strength of the solution for surgical use. The preparation has been tried in the surgical wards of a large military hospital, and solutions of it have been found to be quite as good as the hypochlorite solutions formerly used, i.e., Dakin's sol and eusol. When applied to sloughing wounds in the form of compresses hot and cold, the wounds clear up rapidly and epithelialization is well stimulated. It is eminently suitable for surgical work in the tropics where the solutions of the hypochlorites are liable to deteriorate in chlorine content and so make accurate dispensing impossible.

As an antiseptic pantosept has proved quite up to the standard claimed for it, and it is specially recommended to medical men engaged in surgical work in tropical countries.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Any demand for *reprints, additional to the above*, or for excerpts must be forwarded **at** the time of submission of the article for publication.

Notices of Births, Marriages, and Deaths are inserted in the *Corps News*, free of charge to subscribers. All communications should be written upon one side of the paper only; they should by preference be typewritten; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS." War Office, Whitehall, S.W.1.

The Committee has sanctioned the publication of correspondence on matters of interest to the Corps, and of articles of a non-scientific character under a nom-de-plume. These communications must, however, be approved by the Editor before publication.

MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription is £1 (which includes postage), payable in advance. Single copies, 2s. per copy.

All subscribers to the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, whose annual subscription is paid direct to the Manager of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, will receive monthly a copy of the *Corps News*.

The *Corps News*, separate from the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, can be subscribed for at the rate of 4s. per annum, including postage, payable in advance.

Subscriptions for the *Corps News* separate from the Journal cannot be accepted from Officers on the Active List unless they are also subscribing to the Journal.

The *Corps News* is not on public sale, but obtainable only from the Manager, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS.

Cheques or Postal Orders should be made payable to the "Manager, Journal R.A.M.C." and crossed "Holt & Co."

All communications should be addressed to THE MANAGER, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," A.M.D.2, WAR OFFICE, WHITEHALL, S.W. 1.

All Applications for Advertisements to be made to—
G. STREET & CO., LTD., 8, SERLE STREET, LONDON, W.C. 2.

No. 3. September, 1926. Vol. XLVII.

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

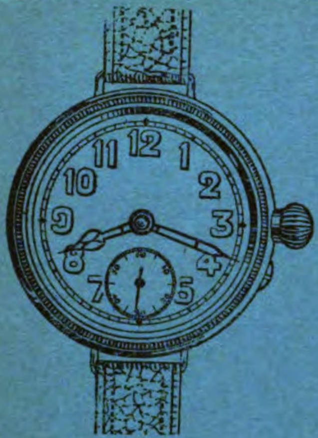
ASSISTED BY

BREVET-COLONEL A. E. HAMERTON, C.M.G., D.S.O., R.A.M.C.

ISSUED MONTHLY

Printed and Published by
JOHN BALE, SONS & DANIELSSON, LTD.
83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

Price Two Shillings net.



Vol. XLVII. September, 1926. No. 3.

Journal
of the
Royal Army Medical Corps.

Original Communications.

A TACTICAL SCHEME SET AT AN EXAMINATION FOR THE PROMOTION OF MAJORS TO THE RANK OF LIEUTENANT-COLONEL.

By Lieutenant-Colonel E. P. SEWELL, C.M.G., D.S.O., V.H.S.
Royal Army Medical Corps.

The following tactical scheme was set at a recent examination held at Poona for the promotion of Majors, R.A.M.C., to the rank of Lieutenant-Colonel. It is hoped that its publication may be useful to other Majors who are trying to screw up courage to face the ordeal, which, in this case at any rate, the candidates asserted in no measured tones was a very real one. It will no doubt be encouraging to future victims to know that all the candidates obtained pass marks and one qualified for distinction.

The solutions of the tasks given below are those of the candidates adjudged best in each case by the Board of Examiners and the criticism of the Board follows each solution. It is thought that the adoption of this method will prove more helpful to future candidates than a simple presentation of the Board's solutions.

The actual work in the field occupied three days, and the candidates were given a week in which to study the general and special ideas and to write their appreciations.

SCHEME FOR STAFF RIDE, OCTOBER 21 TO 23, IN CONNECTION WITH THE EXAMINATION OF MAJORS, R.A.M.C.

Reference Map, 47 F/10; 1 *inch Poona District*, F/14, *and Indian Atlas Sheet*, 39 *N.W.*

GENERAL IDEA.

Yellowland—a strong sea power—has attacked Brownland (India), captured Karachi and Bombay, landed armies at each of these ports, and is advancing inland along the main railways.

Brownland's forces, consisting of a Northern Force, a Western Force, and a Southern Force, each force comprising an Army Corps of three divisions and a cavalry brigade, are mobilized. The Western Army has checked the advance from Karachi, and the Southern Army has taken up positions along the line of the Western Ghats astride the main roads and railways at Khandala and Igatpuri. The Northern Army is being railed to the support of both the Western and Southern Armies.

Yellowland is evidently preparing at Kalyan to attack either towards Nasik or towards Poona, but it is not at present clear in which direction the main attack will develop.

SPECIAL IDEA.

The 3rd Army Corps of the Brown Army (headquarters, Ahmednagar) consisting of the 7th, 8th and 9th Infantry Divisions, and the 3rd Cavalry Brigade, is entrusted with the task of holding up the advance of Yellowland southwards and eastwards from Bombay. The 7th Division is entrenched astride the G.I.P. main line on the summit of the Ghats west of Nasik (headquarters, Nasik). The 8th Division is holding the heights north and south of Khandala (headquarters, Lonavla). The 9th Division and 3rd Cavalry Brigade and Army Troops are held in reserve at Ahmednagar.

Poona is an important depot and ammunition factory. The G.O.C. 3rd Army Corps has given orders that it must be saved from capture at all costs. At the same time the loss of Nasik would be a serious blow to Brownland's prestige and open the way into the heart of the country.

The strength of Yellow's force at Kalyan is estimated at three divisions, and until it is clear in which direction the attack will be made, the G.O.C. has decided to keep one division at Ahmednagar ready to be railed either to Poona or to Nasik.

The 1st Division of the Northern Army is due to arrive at Manmad Junction shortly and will be available to support the 3rd Army Corps either at Nasik or at Poona as required.

Strength and equipment as in war establishments, Indian railways,

roads and geographical features are as they exist, except that the following roads may be assumed to be in good condition and suitable for motor cars, and the rivers where crossed by these roads to be bridged.

(1) The old Bombay road, i.e., Poona, Aundh, Raoat Junction, with Bombay road at Pt. 2042.

(2) Track leaving Alandi road at 5¾ miles from Poona, passing wireless station, Point 1914, Point 1944, and joining main Bombay road near Point 2053.

(3) Track leaving Alandi-Poona road at F 2578, joining Moshi road at F 1188.

Climate as in October.

Enemy's strength and equipment as in war establishments (India).

Sholapur and Belgaum may be assumed to be the bases of Brownland's Southern Army, and these towns, as well as Kolhapur and Dhond, may be considered large towns with an adequate water supply and good entraining facilities.

ORDER OF BATTLE OF 3RD ARMY CORPS AND ATTACHED TROOPS.

Headquarters of 3rd Army.
7th Infantry Division.
8th Infantry Division.
9th Infantry Division.
3rd Cavalry Brigade.
Headquarters 3rd Medium Artillery Brigade.

- Three medium artillery batteries (horse-drawn).
- Army troops, company sappers and miners.
- Printing section, sappers and miners.
- Photolithic section, sappers and miners.
- Corps signals.
- Armoured car company.
- Divisional reserve park.
- Three bakery sections.
- Three butchery sections.
- Three mobile veterinary sections.
- Three casualty clearing sections.
- One bearer unit.
- Two motor ambulance convoys.
- Two ambulance trains (standard gauge).
- Two ambulance trains (narrow gauge).
- One X-ray unit.
- One advanced depot medical stores.
- One base depot medical stores.
- Three British general hospitals.

Three Indian general hospitals.
Twelve British staging sections.
Twelve Indian staging sections.
Three Army co-operation squadrons R.A.F.

Task 1.

As D.D.M.S. 3rd Army Corps and attached troops, write an appreciation of the situation on October 15 and give the proposed distribution of your medical units.

SECRET.

MEDICAL APPRECIATION OF THE SITUATION BY COLONEL.................
D.D.M.S., 3RD ARMY CORPS.

Reference O.S. Maps, 47 7/10; 1 *inch Poona District*, F/14, *and Indian Atlas Sheet*, 39 *N.W.*

Ahmednagar,
October 15, 1925.

I. *Information from Headquarters.*

(i) Estimation of strength of opposing forces.

(*a*) *3rd Army Corps*, of three divisions of 17,736 men each, one cavalry brigade of 2,598 and corps troops = appproximately *60,000 fighting troops*, and with L. of C. troops at the rate of 1 to 4. Total strength = 75,000 men (see attached table "A").

(*b*) *The enemy's force*, three divisions; probable strength, 60,000-70,000 men.

(ii) *Present position.*

(*a*) OF OUR FORCE (see sketch map, page 176).

The 3rd Corps headquarters is at Ahmednagar.

The 7th Division is entrenched astride the G.I.P. main line on the summit of the Ghats, west of Nasik (headquarters, Nasik).

The 8th Division is holding the heights north and south of Khandala (headquarters, Lonavla).

The 9th Division and 3rd Cavalry Brigade and Army Troops are in reserve at Ahmednagar.

Advanced bases and railheads are Manmad for 7th Division and Poona for 8th Division.

Our bases are Sholapur on broad-gauge line and Belgaum on narrow-gauge line.

Lines of Communication.—Broad-gauge Railway G.I.P.: Bombay to Deolali, etc.; Bombay, Poona to Sholapur with intercommunicating line Manmad to Dhond. Narrow-gauge-line: Poona to Belgaum.

Roads.—Bombay to Poona to Dhond. Bombay to Nasik to Manmad.

Trunk Roads.—Nasik, Sangamner to Lonavla and Poona. Poona to Ahmednagar. Ahmednagar to Dhond. Poona to Belgaum.

(*b*) Enemy's Position.

At Kalyan waiting to attack towards Nasik or Poona.

(iii) *Equipment.*

(*a*) Our Force (as in W.E. India)—Modern armament. Air service. Armoured cars.

(*b*) Enemy. Modern armament, probable air service. No additional information available from headquarters.

II. *Intention, Policy, and Object of Force.*

The Corps is entrusted with the task of opposing the enemy's advance either towards Nasik or Poona.

Poona is an important depot and ammunition factory, and must be saved at all costs.

It is therefore presumed that a further retreat beyond Poona is unlikely, and Poona can be used as an advanced medical base for the 8th Division.

The Northern Army is sending its 1st Division to Manmad to support the 3rd Army Corps either at Nasik or Poona.

Manmad can therefore be presumed to be able to be used as an advanced medical base for the 7th Division.

III. *Medical Arrangements* (broad outlines).

The medical units are mobilized on the Indian War Establishment scale. No auxiliary services are available. The hospital accommodation at the advanced bases and bases will be buildings used as station hospitals, etc., augmented by tent accommodation.

The medical units are divided into three zones :—

(1) The collecting zone, embracing: Divisional Units—Field ambulances, sanitary sections, bearer units and M.A.C.'s.

(2) The evacuating zone, embracing: Staging sections, M.A.C.'s casualty clearing stations, ambulance trains, and depot medical stores.

(3) The distributing zone, embracing: General hospitals, base convalescent depots, L. of C. sanitary sections, and base depot medical stores.

IV. *Topographical Influences on the Campaign.*

(*a*) The Country.

Hilly round the Ghats.

Flat plains E. of the Ghats.

Railways.—Single broad gauge from Bombay to Sholapur and Manmad, with connecting line Manmad to Dhond. Single narrow gange, Poona to Belgaum. They provide good train transport for evacuation of causualties.

Roads.—Trunk roads good for M.T. transport, with steep gradients in the Ghats. Provide good evacuation lines for M.T. transport. Kutcha roads can be used by wheel (horse) and pack transport. Pack transport, mules, riding ponies, camels, with cacolets, travois, will be necessary in the hill districts, where roads are non-existent.

(*b*) CLIMATE.

Now fairly equable, hot in the day, cooling down at night. Dry in general, but thunderstorms are possible.

Clothing suitable : shirt-sleeves and shorts in day.

Heat-stroke cases not likely.

A blanket necessary at night.

Long marches should, if possible, be undertaken in the early mornings or evenings.

(*c*) SUPPLIES—ample. Subsistence on the country is possible.

Water supply—dangerous. All water must be chlorinated and carried in unit water-carts or pukkhals. Tanks of chlorinated water should be erected on the main roads. Water-borne diseases, e.g., enteric, dysentery and cholera, must be prepared for—troops must be warned accordingly.

(*d*) PREVALENT DISEASES.

(i) Malaria. This must be guarded against by taking anti-malarial measures.

(ii) Sandfly fever. This must be guarded against by taking anti-sandfly measures.

(iii) Small-pox. This must be guarded against by efficient vaccination of troops.

(iv) Cholera, enteric and dysentery. These must be guarded against by good water supply; keeping down of flies; cleansing of fruit and general good sanitation; and inoculation against enteric and against cholera.

(v) Influenza and pneumonia. These must be guarded against by providing blankets to troops at night; good feeding, and not overcrowding.

(vi) Scabies and lice (causing typhus, trench fever, relapsing fever). These must be guarded against by providing baths and disinfestation centres, and clean clothing for troops.

(vii) Venereal disease. This must be guarded against by providing anti-venereal outfits; lecturing to troops, and providing recreation and games.

The sick-rate likely is about 0·5 per cent, or five per 1,000 of troops daily.

The Assistant-Director of Hygiene will draw up short sanitary instructions with reference to above diseases.

V. *Class of Wounds likely.*

Bullet and shell and H.E. wounds.

Gas will probably be used by the enemy.

Tetanus and gas gangrene will not, it is hoped, be very prevalent.

Anti-gas measures must be prepared.

VI. *Estimation of Casualties.*

(*a*) BATTLE CASUALTIES. Take ten per cent of three-fifths of total force of fighting troops. The fighting troops are estimated at 60,000 (see para. I), therefore total casualties in any single engagement in which all the troops are involved = 3,600; deduct twenty per cent for killed and missing = 2,880 wounded; deduct ten per cent who do not require evacuation beyond the divisional field ambulance = 2,520 cases—which require motor and train accommodation, and hospital accommodation in C.C.S. and at the bases on any given day. Thirty per cent of these cases will require evacuation to home territory when possible.

Of these wounded: Sixty per cent will be sitting cases, twenty per cent will be walking cases, twenty per cent will be lying cases; and five per cent of the lying cases will probably not be able to be moved from the divisional areas.

This is an estimate of total wounded in the whole force in a general engagement involving all the fighting forces on any given day.

(*b*) SICK WASTAGE. The daily sick admissions may be estimated in this subtropical country as 0·5 per cent, or five per 1,000 troops. Ten per cent of these sick will require evacuation to home territory when possible. The total force of fighting and L. of C. units, etc., is 75,000 (see para. I)—0·5 per cent of 75,000 is 375, therefore daily sick-rate is 375. Of this number, forty per cent will be discharged hospital in seven days, fifty per cent will be discharged hospital in twenty-one days, and ten per cent will be evacuated from tenth day daily.

To calculate bed state necessary for sick (see following table) :—

Day	Admissions	Discharges	Evacuations	Remaining
1	375	*Nil*	*Nil*	375
2	375	,,	,,	750
3	375	,,	,,	1,125
4	375	,,	,,	1,500
5	375	,,	,,	1,875
6	375	,,	,,	2,250
7	375	150	,,	2,475
8	375	150	,,	2,700
9	375	150	,,	2,925
10	375	150	37	3,113
11	375	150	37	3,301
12	375	150	37	3,489
13	375	150	37	3,677
14	375	150	37	3,865
15	375	150	37	4,053
16	375	150	37	4,241
17	375	150	37	4,429
18	375	150	37	4,617
19	375	150	37	4,805
20	375	150	37	4,993
21	375	338	37	4,993

Therefore, the bed accommodation necessary for sick is 4,993 beds.

(*c*) The necessary hospital accommodation :—

For wounded is	2,520	beds.
For sick is	4,993	,,
A reserve of 25 per cent is	1,834	,,
	9,347	,,

Therefore, approximate accommodation for beds required on any one day is *9,000 beds*. (This usually works out as ten to twenty per cent of force.)

(*d*) HOSPITAL ACCOMMODATION AVAILABLE. Field ambulances, staging sections and C.C.S.s are essentially units which do not keep sick and should not be included in units affording accommodation for cases requiring evacuation. But as the deficiency of beds in the force is, as I am going to show, so large, I shall include the beds of staging sections and C.C.S.s in my calculation.

Beds available—

12 British staging sections ...	=	600	beds at most.
12 Indian staging centres ...	=	600	,,
3 C.C.S.s	=	600	,,
3 general hospitals for British	=	1,560	
3 ,, ,, Indians	=	1,500	
Beds available	=	4,860	

Therefore there is at the present time at the very least a deficiency of 4,149 beds.

If I worked out the hospital accommodation without counting staging sections and C.C.S. accommodation, there would be a deficiency of 5,940 beds.

This is a very serious state of affairs, and I must at once ask for at least two more British general hospitals and six more Indian general hospitals for the bases.

Convalescent depots at the bases should be organized at once and will help to meet the situation: they are not included in Indian establishments, but can be easily organized so as to take over 2,000 convalescent patients each.

VII. *Distribution of Medical Units.*

The medical units will be distributed as follows:—

(1) Divisional Medical Units (= collecting zone).

Three field ambulances are with each division under their respective A.D.M.S.'s, and M.D.S.'s and A.D.S.'s are formed under their (A.D.M.S.) arrangements, i.e., three F.A.S. in the Nasik area; three F.A.S. in the Khandala area, and three F.A.S. in the Ahmednagar area.

One sanitary section is with each division.

A half-bearer unit is with 8th Division under A.D.M.S.

A half-bearer unit is with 7th Division under A.D.M.S.

One section No. 1 M.A.C. (fifteen cars) is with 8th Division under A.D.M.S.

One section No. 2 M.A.C. (fifteen cars) is with 7th Division under A.D.M.S.

Two British staging sections } are under the orders of A.D.M.S.
Two Indian staging sections } 7th Division in Nasik area.

Two British staging sections } are under the orders of A.D.M.S.
Two Indian staging sections } 8th Division in Khandala area.

(These staging sections can reinforce M.D.S.'s or form stages of evacuation between the M.D.S. and C.C.S. if the evacuation is long and difficult.)

(2) Non-divisional Units (evacuating zone).

Four British staging sections } are at Ahmednagar.
Four Indian staging sections }

Four British staging sections } are at Poona packed and ready
Four Indian staging sections } to move.

One C.C.S. is at Poona open and ready to receive casualties from the 8th Division.

One C.C.S. is at Manmad open and ready to receive casualties from the 7th Division.

One C.C.S. is at Dhond packed on railway trucks and ready to move where directed.

(There are dumps of 1,000 stretchers and 2,000 blankets at the C.C.S. at Poona and Manmad, also 200 additional Thomas splints. These can be sent to F.A.'s by M.A.C's.)

Headquarters' section and one section No. 1 M.A.C. is at Poona.

Headquarters' section and one section No. 2 M.A.C. is at Manmad.

One ambulance train, broad-gauge, is garaged at Manmad.

One ambulance train, broad-gauge, is garaged at Dhond.

Two ambulance trains, narrow-gauge, are garaged at Poona.

One advanced depot medical stores is at Poona.

(3) L. of C. Units (distributing zone).

One British general hospital—520 beds for the reception of abdominal wounds, wounds of chest, wounds of head, and fractured femurs—is at Dhond.

One Indian general hospital—500 beds for similar cases—is open at Dhond.

The above two hospitals have also fifty beds each for venereal cases.

One British general hospital is at Sholapur.

One Indian general hospital is at Sholapur.

One British general hospital is at Belgaum.

One Indian general hospital is at Kolhapur.

One base depot medical stores is at Belgaum.

One X-ray unit is with the general hospital at Dhond.

VIII. *Summary.*

(1) Wastage. Thirty per cent of wounded and 10 per cent of sick will require evacuation to home territory when possible. The normal scale of reinforcements will be necessary.

(2) Evacuation. Two lines of railway and good roads are available. *Two temporary ambulance* trains—one on the broad gauge and one on the narrow gauge—should be got ready to relieve the four ambulance trains available, and used to clear sitting cases.

The M.T. transport is insufficient, the transport of field ambulances consisting of bullock tongas and riding ponies is obsolete. Motor ambulance cars should be provided for field ambulances at the ratio of six light Ford cars and four heavy cars per ambulance, and the two sections of M.A.C. I have been obliged to attach to divisions should be free to join their units and perform their proper function, i.e., to clear from the M.D.S. to C.C.S.

(3) ACCOMMODATION, as stated in paras. VI (*c*) and (*e*), and VII. The bed accommodation at the bases is dangerously low, especially for Indian cases.

Crisis expansions (fifty per cent) of general hospital should not be attempted at the beginning of a campaign.

Total accommodation available is 4,860 (including C.C.S. and staging sections).

Total accommodation required is 9,000 beds.

I require at least two more general hospitals for British cases and six more general hospitals for Indian cases (30 beds are required for sick sisters and also an infectious hospital of 600 beds). (The proportion of British to Indian troops is roughly 1 to 3.)

I also require two more advanced depots medical stores.
,, ,, one more base depot medical stores.
,, ,, two more mobile X-ray laboratories.
,, ,, one more mobile hygiene laboratory.
,, ,, two more mobile bacteriological laboratories.

I require two temporary ambulance trains organized.

Sanitary sections are required at the rate of one per division, and one for the corps area, and one for each base area.

Two dental centres are required (one for each base area).

(4) A surgical consultant and medical consultant is required (see para. VII).

(5) A followers' hospital must be formed, as there are nearly 10,000 followers attached to the force.

(6) *Sanitation.*—The special dangers of the country are as stated in para. IV (*d*).

Special sanitary instructions will be issued by the Assistant-Director of Hygiene, D.D.M.S., 3rd Army Corps.

TABLE A.—ESTIMATION OF STRENGTH OF 3RD ARMY CORPS.

Unit	British	Indian	Total	Followers
7th Indian Division	4,310 ..	13,426 ..	17,736 ..	2,899
8th ,, ,, ...	4,310 ..	13,426 ..	17,736 ..	2,899
9th ,, ,, ...	4,310 ..	13,426 ..	17,736 ..	2,899
3rd Cavalry Brigade	749 ..	1,749 ..	2,598 ..	551
Headquarters 3rd Ind. Art. Bde...	13 ..	1 ..	14 ..	—
Three Medium Artillery Batteries	279 ..	187 ..	466 ..	—
Army Troops Co. S. & M. ..	8 ..	128 ..	206 ..	—
Printing Section S. & M. ..	2 ..	6 ..	8 ..	—
Photolithic Section S. & M. ..	2 ..	6 ..	8 ..	—
Corps Signals	116 ..	31 ..	147 ..	—
Armoured Cars Co.	140 ..	7 ..	147 ..	—
Divn. Reserve Park	12 ..	743 ..	755 ..	—
Three Bakery Sections	1 ..	33 ..	34 ..	—
,, Butchery ,, ...	1 ..	33 ..	34 ..	—
,, Mobile Veterinary Section..	3 ..	70 ..	73 ..	—
	14,426	43,272	57,698	about 10,000

To calculate fighting troops ... = about 60,000
The proportion of British to Indian is about 1 to 3
Lines of communication troops are reckoned at 1 to 4
And therefore they total ... 15,000

Total number of troops ... 75,000

CRITICISM BY BOARD OF EXAMINERS.

(1) In calculating strengths, take the factors given and work on those. The actual numbers of troops for which you are responsible are given.

(2) The demand for extra units is based on faulty appreciation. You are dealing with only one corps of a national army, not an isolated army in a foreign country.

Therefore it is unnecessary to mobilize war units to receive all the sick and wounded of a protracted campaign. It will take three weeks to accumulate the 9,000 casualties anticipated, and during that time the D.M.S. will have ample time to organize the hospital resources of the country to receive them.

(3) If a complete estimate of all casualties were attempted, those from the 1st Division due to arrive in a few days should have been included.

(4) As it is impossible at present to forecast where the fighting will take place and what troops will be engaged, it would be better to estimate the possible casualties of the troops in contact with the enemy on each front for the next few days only, and to make a supplementary estimate of the total casualties in the event of all our troops being engaged later on.

(5) The position of C.C.S.'s is too far back.

Poona is forty-one miles and Manmad is seventy-seven miles behind our present positions.

The following is considered a suitable distribution of medical units until the situation develops.

Casualty clearing stations—at Deolali, Talegaon and Ahmednagar.

Bearer unit—half with 7th Division and half with 8th Division.

Motor ambulance convoys—one at Deolali-Nasik; one at Talegaon-Poona. It should be noted that the direct trunk road from Nasik to Poona gives facilities for a rapid transfer of the M.A.C. from one front to the other.

Ambulance trains (standard gauge) at Nasik and Poona.

Ambulance trains (metre gauge) at Poona.

General Hospitals—British and Indian. One of each at Sholapur, Belgaum and Dhond.

X-ray unit at Dhond.

Advanced depot medical stores at Ahmednagar.

Base depot medical stores at Sholapur.

Staging Sections. These units are not actually required in the present situation, but they might be employed to provide rest stations at rail heads and important junctions. Owing to the change of gauge at Poona some medical unit would be required at that station, and some of the staging sections might well be placed there.

Task 1—*A*. *To be handed in at* 7 *a.m. on October* 21.

Draft Medical Orders for inclusion in 3rd Army Corps Standing Orders.

Solution of Task 1—*A*.

Draft Medical Orders for inclusion in 3rd Army Corps Standing Orders, by Colonel .... D.D.M.S., 3rd Army Corps, October 20, 1925:—

(1) Disposal of sick: In camps and on the line of march sick will be seen under unit arrangements; details having no medical officer will attend the nearest medical unit. Sick requiring hospital treatment will be despatched so as to reach the medical unit detailed for their reception by 09.00 hours daily.

(2) Medical inspections: All troops will be medically inspected at least once a week for the presence of skin disease, scabies and lice; the inspection will include the men's bodies and their clothing.

Infected men will be sent to the medical unit detailed to treat such cases, also their clothing and bedding for disinfection.

All troops on arrival or departure from a camp will invariably be medically inspected.

(3) The use of ambulance cars for other purposes than the transport of sick and wounded is forbidden.

(4) Drinking water. No water unless rendered safe for drinking pur-

poses will be used—authorized sources of supply will be labelled "Drinking water."

The danger of drinking unsafe water will be specially pointed out to all troops.

(5) Camping grounds must at all times be clean and in good order; all ranks are expected to maintain the highest standard of sanitation.

Every precaution must be taken to prevent fouling of the ground; properly constructed washing and ablution places will be made, and washing in and around tents strictly forbidden.

Arrangements will be made for the cooking, protection and distribution of the food, and for the disposal of refuse and sullage water.

A unit vacating a camp is responsible that it is left in a clean and sanitary condition.

(6) Foodstuffs, mineral waters and fruits will be obtained only from military canteens, institutes and other authorized sources.

Hawkers are not to be allowed access to the camp on any account whatsoever.

(7) Flies must always be regarded as a menace to the health of the troops, and every effort made to destroy them and prevent breeding places.

The absence of flies is an indication of a high standard of sanitary efficiency.

(8) Disposal of excreta whenever possible will be by bucket removal and incineration combined. Otherwise by deep trenches. No form of pit is to be made near an incinerator, and ashes from incinerators will be piled in heaps. Scrupulous cleanliness in and around sanitary areas will be maintained.

(9) Camp refuse will be disposed of by incineration; tins after removal from the incinerator will be piled in a separate place.

(10) Sullage water will be disposed of by properly constructed grease traps and soakage pits.

(11) Ablution and washing water will be disposed of by surface drainage or soakage pits.

(12) Horse litter and manure not disposed of by incineration will be "close-packed."

(13) Slaughtering places will be at a distance from camping grounds; wherever possible an impermeable surface with a gutter will be provided on which animals will be slaughtered. Scrupulous cleanliness will be maintained. Offal will be disposed of by incineration.

(14) Carcases of animals dying in camp will be removed from the camp area and disposed of by burning—otherwise by burial.

(15) Antimalaria measures require a careful selection of camp sites, good drainage, prevention of collections of water, and clearance of undergrowth.

Antimalaria squads will be formed in all camp areas. Mosquito nets will be used by all troops.

Shorts will not be worn between "retreat" and "reveille."

(16) Troops travelling by train will be provided with an adequate supply of drinking water, both on the train and at the authorized halts.

Halts with suitable sanitary arrangements will be provided to allow men an opportunity to relieve themselves.

Overcrowding in trains is to be avoided.

(17) For troops camped in or near towns prophylactic treatment rooms will be provided.

Colonel ....

D.D.M.S., *3rd Army Corps.*

Criticism of Task 1—*A, by Board of Examiners.*

Good, clear orders and fairly complete. A reference to the relevant sections in Field Service Regulations would not be out of place.

NARRATIVE NO. 1.

(To be given out on October 21.)

On October 19, Yellow made an attack with two divisions on the Brown position at Khandala, and after very heavy fighting succeeded in dislodging the 8th Division from their positions and forced them to retire as far as Talegaon-Dabhade. Casualties of the 8th Division amounting to about 2,000 were evacuated to the C.C.S. at Talegaon-Dabhade and by hospital train and M.A.C. thence to Poona.

Subsequently the C.C.S. was closed and re-opened at (place to be selected by candidates).

The 9th Division began to arrive in Poona by train on the morning of the 21st and will be ready to march by noon.

On the evening of the 20th the 8th Division occupied the following position astride the main Bombay road from Kinhai (Y.4520) to Raoat (E.4786).

The following operation orders were issued :—

SECRET.

Copy No. ......

8TH DIVISION OPERATION ORDER NO. 100.

Reference Map, Poona District. Sheet 47, F/10 *and* F/14, *one inch to one mile.*

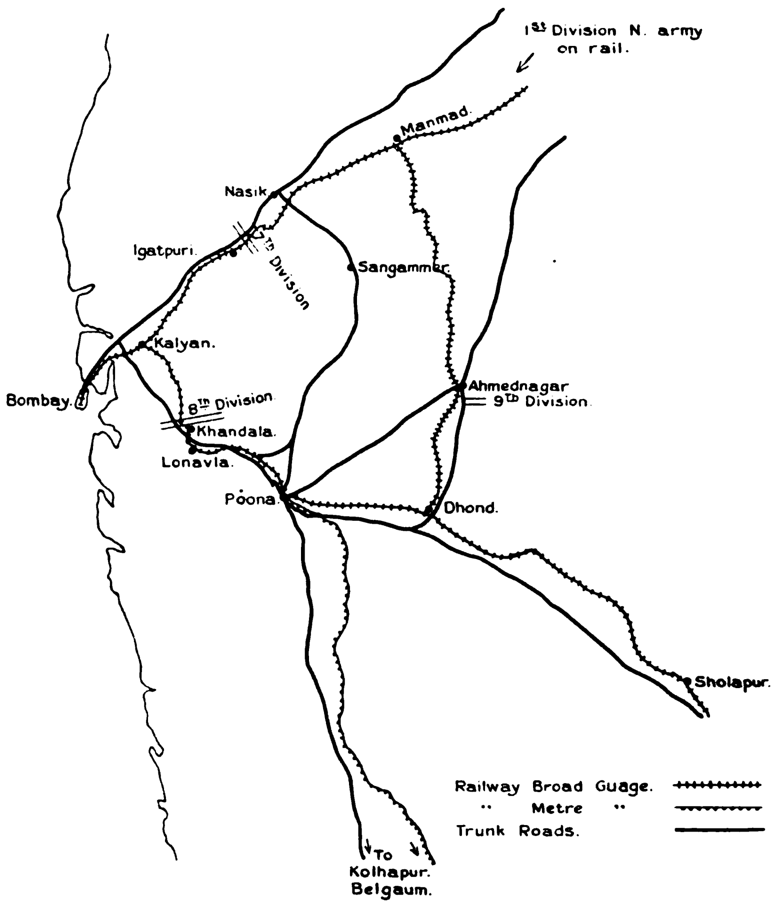
October 20, 1925.

Information.—(*a*) The enemy estimated at two infantry divisions has succeeded in forcing the 8th Infantry Division to withdraw from their position at Khandala in an easterly direction along the main Poona-Bombay road.

(*b*) The 9th Infantry Division is due to arrive at Poona on October 21 and will be ready to advance by noon of that day.

Intention.—(*a*) The 8th Infantry Division will take up a position running north and south between Kinhai (Y.4520) and Raoat (E.4786)

SKETCH MAP.



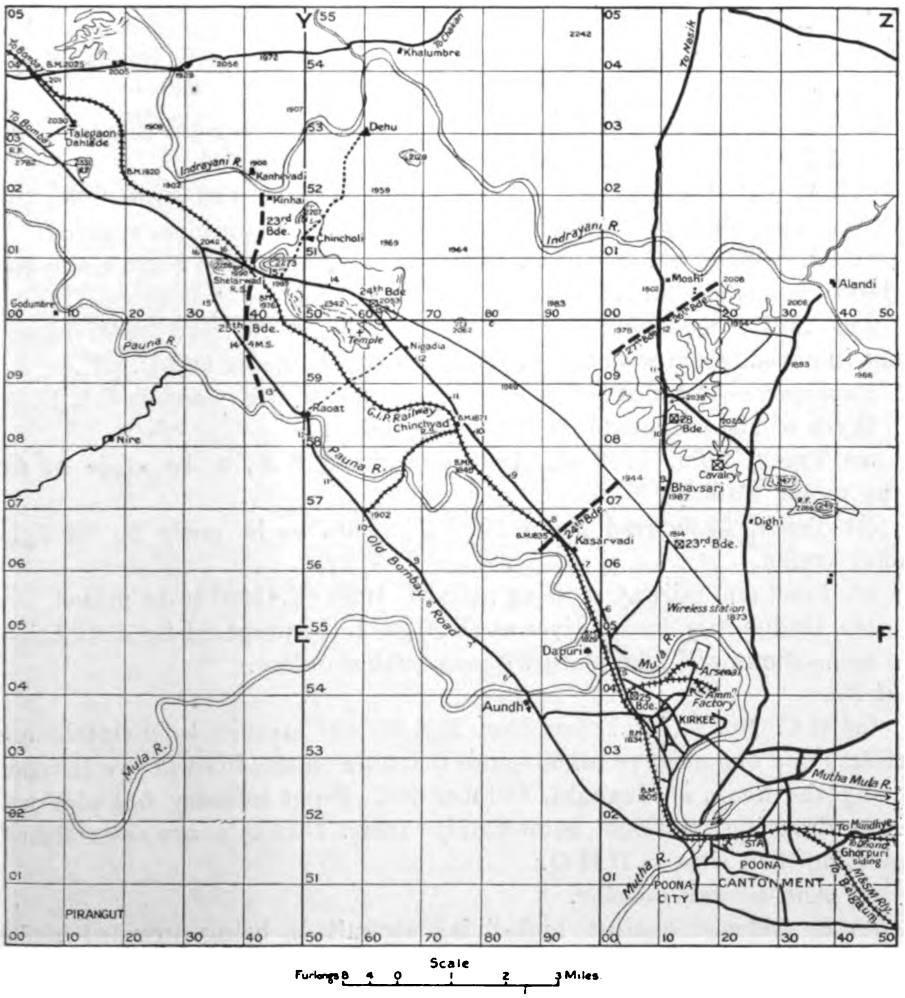
Distances.—Khandala to Poona	..	..	41 miles
Nasik to Manmad..	..	..	88 ,,
Manmad to Ahmednagar	..	..	95 ,,
Poona to Ahmednagar	..	..	75 ,,
Poona to Sholapur	..	..	164 ,,
Poona to Kolhapur	..	..	146 ,,
Poona to Balgaum	..	..	214 ,,
Poona to Nasik ..	..	..	120 ,,

covering the Poona-Bombay railway and the roads to the south of the Indrayani river.

(*b*) Will stop the advance of the enemy on that line.

Method of Execution.—The position will be occupied by the 23rd Infantry Brigade on the right and the 25th Infantry Brigade on the left.

The 24th Infantry Brigade will be in divisional reserve at 13 M.S Poona-Bombay road.



Boundaries between brigade sectors (all inclusive to right sector) Poona-Bombay road.

The position will be organized in depth on the line Kinhai (Y.4520)—Chincholi (Y.5113)—14½ M.S. Poona-Bombay road—B.M. 1976 (Y.4603)—13 M.S. old Bombay road to Pauna river west of Raoat village (E.4487).

The front of the position will be on the following line—nullah running north and south 400x west of Kinhai—B.M. 1995 (Y.4108)—14 M.S. old Bombay road—bend of Pauna river (E.4487).

Divisional Reserve.—The 24th Infantry Brigade will occupy a position covering the main Poona road and the road to the north—Point 1969 (E.8789), Point 1944 (F.0375), wireless station.

The 24th Infantry Brigade will carry out a reconnaissance of the country south-west of 13 M.S. Poona-Bombay road towards Raoat village with a view to counter-attack.

Artillery.—20th Field Brigade, R.A., will cover the right sector.

21st Field Brigade, R.A., will cover the left sector.

C.R.A. will detail No. 101 P. Battalion, R.A. (How) to come under the orders of Brigade Commander 23rd Infantry Brigade for close support.

C.R.A. will detail No. 101 P. Battalion, R.A. (How) to come under the orders of Brigade Commander 25th Infantry Brigade for close support.

Anti-tank defence will be arranged by the C.R.A. over the divisional front in consultation with the C.'s. C. Infantry Brigades and C.R.E.

Engineers.—Detailed orders have been issued to R.E. units by C.R.E.

Work will be executed in the following order :—

(*a*) Track, Point 1969 (E.8789), Chinchvad R.S., to be made fit for light motor traffic.

(*b*) Track, Chinchvad Point 1902 (E.6069), to be made fit for light motor traffic.

(*c*) Road and railway crossing at B.M. 1995 (Y.4108) to be mined.

(*d*) Bridge over Pauna river at (E.5185) to be prepared for demolition. No demolitions will take place without further orders.

R.A.F.

(*a*) O.C. No. 2 (A.C.) Squadron R.A.F. will arrange to maintain one artillery and one close reconnaissance machine on the front of the Division during the hours of daylight, October 20. Front infantry brigades will mark dropping stations immediately their D.H.Q.'s are established, reporting their sites to D.H.Q.

(*b*) Anti-aircraft defence.

(i) Defence against high-flying aircraft is being provided under corps arrangements.

(ii) Infantry brigades will be responsible for their own protection against low-flying aircraft.

Administrative.

(*a*) Ammunition and supplies, Kirkee R.S. A.R.P. will be opened at Kirkee R.S. S.R.P. will be opened at Kirkee R.S. Details of routes and meeting places have been issued separately.

(*b*) Medical. To be issued by A.D.M.S., 8th Infantry Division.

Intercommunication.

D.H.Q., R.A. and R.E. will close at Shelarwadi R.S. (Y.4108) at 14.30 hours, October 20, and open at 11 M.S. Poona-Bombay road at the same time.

Advanced D.H.Q. will open at Road Junction (Y.5904) at 14.00 hours, October 20.

H.Q. 23rd Infantry Brigade, 20th Field Brigade, R.A., at Point 1969 (Y.6312).

25th Infantry Brigade 21st Field Brigade, R.A., at Temple (E.5897).

24th Infantry Brigade, H.Q. P. Art. Brigade, less two battalions, 13 M.S. Poona-Bombay road.

Acknowledge.

Colonel, General Staff,
8th Infantry Division.

Issued to signals at 14.00 hours.
Distribution as per order of battle.

(*To be continued.*)

STUDIES IN MOSQUITO BIONOMICS.

By Major C. H. H. HAROLD.
Royal Army Medical Corps.

(Continued from p. 94.)

Larvicidal Action of Cresol.

Early in 1925 a drum of cresol was received for an examination of its efficiency as a larvicide. As regards its chemical and physical conditions and germicidal action it conformed to specification. It had been stated that on account of its non-effective character the anti-mosquito work in a particular Crown colony was disorganized and that it was inferior to a similar preparation manufactured by a rival firm. It should be pointed out that the use of cresol in the Army is normally restricted to germicidal requirements and the specification is based on these. As medical and entomological journals frequently contain details regarding the efficiency of cresols, it is thought that the insertion of the following will not add appreciably to existing confusion.

On the face of it, it would appear a simple matter to mix a little cresol in water, drop a few larvæ into the solution and note the effects, but at the same time, from consideration of the literature, some good reasons must exist to account for the wide divergence in the results obtained.

The biological tests for these disinfectants are germicidal ones, and it is also claimed that many of these preparations are non-toxic to animals. As the mosquito belongs to the animal kingdom, it would appear inadvisable to base any speculations regarding their utility on the results of such tests. In addition the majority of these disinfectants are compounded with emulsifying agents, olein, resin, castor-oil made into soaps, and stabilizers such as glue and dextrin are also used. The complex which maintains a fine homogeneous emulsion in the presence of such substances as salt or urine is of particular value in promotion of germicidal action.

The next point is the character of the chemical in suspension. Undoubtedly in the past *O*, *M*, and *P* cresols were components of such fluids, but I have been informed that few of them contain anything but the merest trace of these. In their manufacture use is made of the higher di-methyl and tri-methyl phenoloids which possess a lower toxicity and a higher germicidal power, and some are credited with a R.W. co-efficient of at least 40. Consequently smaller amounts of such compounds maintained in a fine state of division are more effective as germicides than larger quantities of lower grade phenols.

It is possible that crude cresol preparations used for general disinfection purposes occasionally contain other bodies, e.g., naphthalene and crude

phenol, well-known larvicides. Nowadays, in the manufacture of coal-gas and the distillation of tar, the by-products are of increasing value and less possibility of their inclusion arises, and for the compounding of the present-day higher grade disinfectants the active principles are chiefly derived from blast furnaces or from distillations carried out at carefully controlled temperatures. It is therefore obvious that saponified cresol is not a suspension of a particular chemical entity, but is a trade name covering fluids of a dissimilar composition which satisfy particular standards.

In this instance it was thought that it might be of interest to carry out a comparative examination of certain disinfectants which have been recommended or reported on in other places, and two samples of cresol of good quality, a phenolic preparation sold as a specific larvicide and a high grade germicide were procured.

At this time approaching maturity in the natural breeding places were two species of larvæ, a culicine *A. punctor* and an anopheline *A. bifurcatus*, and both were in an extremely vigorous condition. It was anticipated that these tests would not take up much time, but they were of necessity extended until these broods had emerged. As the young and immature larva readily succumbs to cresol, the plan of making up well-balanced representative collections for each dilution was adhered to throughout. In addition, mortality is markedly affected by the treatment to which the larva has been subjected prior to such tests, e.g., exposed to sunlight, shaken violently in bottles during carriage to the laboratory or kept under unsuitable conditions for considerable periods. To eliminate these fallacies the stocks of larvæ for each group of tests were collected as required and used as a rule within half an hour of removal from their natural environment.

Effects of Temperature.

The temperatures employed were within the normal limits for water in small pools in England, and when a variation of 20° F. was permitted larvicidal action was improved and very much accelerated at higher temperatures—e.g., at 48° F., using 1 in 1,000 dilution, *A. punctor* apparently died in fifteen minutes, at 68° F. in two minutes.

When is a Mosquito Larva Dead?

This is an important and often difficult point to decide, seeing that cresol induces a condition of torpor which causes the larva to be immobilized at the bottom in a condition analogous to that described by Klein when investigating the effects of phenol on bacterial spores. He emphasizes the fact that the spores are only "stunned" and not killed, and on inoculation into an animal they rapidly recover and cause death. The torpor affecting the larva may last for a day or more, and on several occasions larvæ which have been in a condition of suspended animation for over forty-eight hours have eventually come to the surface and pupated in the usual way. If

a very careful watch is kept this moribund condition may be seen to be broken by very infrequent tremors and occasional shudders. In the early stages movement may be elicited by lightly touching the fin hairs or mouth brushes with a bristle, and a slight touch will frequently succeed where a more definite one would fail. In non-lethal dilutions, particularly at higher temperatures, larvæ may rapidly fall into a condition of torpor, give no response to stimulation and at first sight be certified dead; still at the end of seventy-two hours they may all be happily swimming about and pupate and emerge in the normal way. Such a state of affairs is very misleading and may easily account for some of the conclusions arrived at. In addition, larvæ of *A. punctor*, which have been in lethal dilutions (1 in 10,000) and shown no sign of life for over two hours, if placed in well-aerated water may eventually resuscitate and be found swimming about unaffected on the following morning.

Apart from the absence of movement on stimulation which may not be a positive sign of death, one of the best indications is a delicate change of hue of the larva which tends to lose its greenish coloration and takes on a greyer tone.

The possible recovery of the larva when transferred to untreated water is noteworthy, seeing that during periods of heavy rain (monsoon), particularly in the tropics, moribund larvæ may be washed into larger collections of water and revive.

Resistance of Larvæ to Cresol.

This can be enhanced by placing larvæ in non-lethal dilutions overnight and transferring them to lethal ones next day, and this point should be taken into consideration when collections of water are intermittently treated. In addition, cresol is frequently recommended for use in pools in the tropics where a minimum lethal dose is subject to enormous and sudden dilution by tropical downpours.

Effects of Organic Matter (Silt).

Apart from the effects of temperature, substances in solution and suspension, the organic silt lining of a pool may play an important part. In the later tests silt was obtained from mosquito pools and at least one inch of this placed in the bottom of all test vessels. The residual water was then drained off and the cresolized water of the required strength poured over this. The effect of the inclusion of silt appeared primarily to lead to a reduction in larvicidal power, and to a large extent the effects of increased temperature were annulled. Larvicidal action was retarded, it became more regular and the results were better differentiated.

EFFECTS OF OTHER CONSTITUENTS OF WATER.

(1) *Acid.*—Control tests demonstrated that *A. punctor* could live for days in waters containing the higher dilutions of mineral acid, but readily

succumbed in a dilution of 1 in 1,000. The conclusion arrived at was that non-lethal dilutions of acid did enhance the action of cresol, but that the amount of acidity requisite to give rise to such improvement was far in excess of the natural content of the most acid type of water.

(2) *Salt.*—In control tests, using plain tap water (acid type), *A. punctor* bred out in twelve days. An addition of NaCl 0·3 per cent. caused the larvæ to die off one by one after exhibiting cannibalism. Extremely large adults were bred out in the same water containing both salt and silt, and on the addition of cresol larvicidal action was considerably improved by the inclusion of salt.

Germicidal and Larvicidal Action Compared.

(1) With the phenols an acceleration of the velocity of germicidal action occurs with higher temperatures, and in this the larvicidal action is in agreement.

(2) The presence of acids in excess of the amounts obtaining in nature gives rise to improved larvicidal action, and in this again the larvicidal and germicidal effects correspond.

(3) An analogous state of affairs also arises in the presence of common salt.

(4) Preparations which maintain superior emulsions and contain special stabilizers other than saponaceous bases are more effective as germicides than as larvicides.

Results obtained with the Various Preparations.

It appeared from the indefinite information volunteered and from chemical analyses that all of these disinfecting fluids contained similar compounds, i.e., higher homologues of phenol, and that their germicidal efficiency was satisfactory.

The particular cresol under suspicion in the presence of organic silt was effective against *A. punctor* in a 1 in 20,000 dilution, and *A. bifurcatus* in 1 in 10,000.

In 1 in 10,000 dilution of the second sample of cresol all anophelines were fit and one pupated during the test.

In the case of the specific larvicide at the end of thirty hours, in a 1 in 10,000 dilution, all anophelines were alive and well, a few culicines were dead and one culicine succeeded in pupating.

In a dilution of 1 in 10,000 of the high-grade germicide all culicines and anophelines were fit and pupating after twenty-two hours.

In all the above non-effective solutions the larvæ pupated and healthy adults eventually emerged.

The following record illustrates the deceptive behaviour of larvæ under the influence of cresol :—

Dilution—1 in 30,000. Temperature of water—62° F. Time—10 a.m.

12 a.m. (2 hours)	1 p.m. (3 hours)	4 p.m. (6 hours)	6 p.m. (8 hours)	10 a.m. (24 hours)	After 30 hours	After 40 hours
Anophelines and culicines all fit at top of the water	Anophelines fit. Some culicines sick but majority on surface of water	Anophelines fit. One culicine at top	All anophelines alive. One pupa emerged (male), *A. bifurcatus*. One culicine alive and active at bottom	Anophelines fit. Culicines at bottom. Some dead; others move briskly when touched	As before	Recovery. All anophelines fit. Culicines with one or two exceptions all coming to the surface

The readings show that eight hours after the commencement of the experiment, i.e., 6 p.m., it is possible that with one exception all culicines might have been certified dead and the experiment terminated. Still at the end of thirty-five hours they commenced to recover, and after forty hours were swimming to the surface.

When considering the action of these larvicides, the following should be borne in mind:—

(1) The pupa is relatively immune to the action of cresol.

(2) This particular culicine is more susceptible than the anopheline.

(3) That under certain conditions larvæ certified as dead may make a complete recovery and the normal emergence of the adult ensue.

Although it is difficult to obtain definite knowledge regarding the exact composition of these disinfectants, it would appear that they all contain higher phenoloids and decrease in toxicity results. The high germicidal power and low toxicity of one preparation is undoubted, and this particular one is the least effective as a larvicide. The phenolid content of both preparations containing special stabilizers was very much in excess of the amounts present in the simple cresols and to these they were markedly inferior. This inferior larvicidal action may not be entirely due to the presence of less toxic compounds, but other factors may also assist. In the two samples of cresol which were relatively more effective, soap was the emulsifying basis, and they also contained the higher homologues of phenol only. The differences in larvicidal action obtained by people using similar preparations can be largely attributed to varying phenolid content, but here again the type of phenoloid present is of some importance.

The pupa which is resistant to these larvicides depends for air upon the two air trumpets on its thorax. It does not eat or ingest water and has no anal gills. The only means by which it can be affected is by absorption through the skin, and as the contained mosquito approaches maturity it is protected by a double covering or integument. When 4th instar larvæ pupate they shed a skin and are temporarily more vulnerable, and an opinion regarding the efficiency of these larvicides can be quickly formed if the pupating larva is unaffected at this time.

It has also been noted that these and other abnormal solutions may

provide a stimulus to this act, and that pupation which may occasionally be a defensive measure in nature, under these conditions, frequently brings about the death of the larva.

Larvæ which are capable of maintaining themselves at the surface and are left undisturbed have a better chance of escaping death. In the early stages of distress they repeatedly pass their syphon or tail end of the body through their mouth brushes, and the convulsive tremors are reminiscent of the results of central poisoning seen in decerebrate animals after infusion with certain phenolic derivatives.

It is noteworthy that poisoned larvæ frequently make a rapid recovery when transferred to well-aerated water, and if the poison were being absorbed from the alimentary tract this should not be the case, seeing that it would take some little time for peptisation of such a dose.

In the lower dilutions of cresol the sides of the vessels frequently become covered with bubbles, and this diminution in the content of dissolved gases should have an effect upon the well-being of larvæ, particularly upon those which are accustomed to make considerable use of their gills.

The difference between the resistance of this culicine larva and the anopheline is striking, one being twice as susceptible as the other. It is reasonable to suggest that both should absorb about the same amount of fluid by the mouth and through the skin. The anopheline, on the one hand, has small papilliform gills and remains on the surface of the water, and this is very noticeable in those solutions which are deficient in gases in solution. *A. punctor*, on the other hand, has well-marked gills and normally spends long periods below the surface, and it is possible that in this its vulnerability lies. If these larvæ are interfered with when in cresol solutions they dive below and readily succumb, whereas if they are permitted to remain at the surface they are more resistant. Their gills are large and retractile, and when at the surface there is less demand for their employment and the absorption of cresol is limited.

As regards the other factors, the relative inefficiency of larvicides containing special stabilizers other than soaps, it is doubtful if saponaceous suspensions owe their superiority entirely to the fact that with special stabilizers, such as glue, there is an increased adsorption of stabilizer and chemical by organic matter of a particulate nature. To the bacterium which absorbs nutriment via its cell envelope a coating of colloid and finely divided disinfectant should be very lethal, but from consideration of the vitality of the pupa this should not lead to an improved larvicidal action, seeing that the non-pupating larva absorbs a negligible quantity of larvicide via the skin. The cells covering the gills are undoubtedly highly specialized, selective in action, and saponaceous bases and fats are frequently selected as vehicles of chemicals on account of their permeative properties.

As suggested by Rideal, salt leads to an alteration in the $\frac{\text{lipoid}}{\text{water}}$ partition co-efficient, and increased fugacity of phenol, and the vital

respiratory membrane covering the gills by osmosis should theoretically reject colloid stabilizers.

In regard to the remarkable recovery of larvæ in certain solutions which rival representatives have attributed to instability of the emulsion and precipitation of larvicide. If this were the case, then the moribund larva at the bottom would be in contact with a layer of solution relatively richer in larvicide and there should be still less chance of its recovery. This is not borne out by the fact that with care larvæ, after immersion in weaker solutions, can be made to withstand lethal ones, hence the recovery of the larva is most likely due to an induced tolerance.

In conclusion, it may not be considered out of place to mention certain other larvicides. The use of petroleum has many drawbacks, and according to some it owes its efficiency very largely to the contained volatile hydrocarbons which act via the respiratory tract. It is equally effective against culicine and anopheline larvæ.

Paris green for the purpose of film formation is normally incorporated with dust or with the exhausts from grain cleansing plant, and certain observers who employ this larvicide almost exclusively are very insistent that it should be scattered directly over groups of larvæ and preferably by hand. In addition, they state that although very effective against anophelines, culicines frequently escape. In this instance it may be inferred that the path of entry of the poison is via the alimentary tract, and that the anopheline feeding on the surface ingests a higher concentration of poison than the culicine which draws its nourishment from a lower level.

Apart from all question of larvicidal efficacy, it is impossible to evade the financial aspect, and having in mind the conditions obtaining in India and similar countries, it is evident that there is still scope for the production and development of new larvicides.

I am indebted to Dr. A. Balfour, C.B., C.M.G., Director, London School of Hygiene, for his encouragement and suggestion regarding the hydrogen ion concentration; to Lieutenant-Colonel S. P. James, I.M.S. (Retired), and Mr. P. G. Shute, of the Ministry of Health, for a supply of fed mosquitoes; to F. W. Edwards, Esq., of the British Museum (Natural History), for his interest and for confirming the identification of numerous larvæ; to Lieutenant-Colonel W. W. Browne, O.B.E., R.A.M.C., O.C., Army School of Hygiene, for the facilities afforded; to Major S. M. Hattersly, M.C., R.A.M.C., for the chemical analysis of several disinfectants; and to Sergt. H. W. Watson, R.A.M.C., Laboratory Assistant, for his help.

Note.—With three exceptions all observations were made prior to June, and the last series of experiments concluded in August, 1925, when the rough draft of the sections was prepared. The gist of the paper has been communicated verbally to various interested people, but owing to pressure of work the publication of the final draft is overdue. This delay accounts for the inclusion of certain minor details which in the light of recent

writings may now be considered superfluous, and for the absence of allusion to recent important publications, notably, "British Mosquitoes and their Control," by F. W. Edwards and Lieutenant-Colonel S. P. James, M.D., and "Physical Factors in Mosquito Ecology," by Ronald Senior White.

LITERATURE.

[1] LANG, W. D., Sc.D. "A Handbook of British Mosquitoes."

[2] PATTEN and CRAIG. "A Textbook of Medical Entomology."

[3] RIDEAL. "Chemical Disinfection and Sterilization."

[4] MACGREGOR. "The Influence of the Hydrogen Ion Concentration in the Development of Mosquito Larvæ," *Parasitology*, vol. xiii, p. 348.

[5] EDWARDS, F. W. "British Mosquitoes, 1920-25," *The Entomologist*, No. 729, February, 1924.

[6] MACGREGOR. "Mosquitoes under Winter Conditions," *Bull. of Ent. Res.*, vol. xv, p. 357.

[7] RUDOLFS. "Mosquito Breeding in Specific Places," *Journ. of Parasitol.*, December, 1924, vol. ii, No. 2, p. 79.

[8] SUTHERLAND on "Precipitins," *Ind. Journ. Med. Res.*, 1920, vol. vii, p. 669; *ibid.*, 1915, vol. iii, p. 205; *ibid.*, 1914, vol. i, p. 707.

[9] MACGREGOR. "Influence of Drought upon Mosquito Life in Surrey," *Bull. Ent. Res.*, vol. xii, p. 205, 1921.

[10] JAMES. "Mosquito Life in Surrey during 1921," *ibid.*, vol. xii, p. 427, 1921.

[11] HAROLD. "The Breeding of *Anopheles maculipennis* in Captivity," JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, October, 1923.

CRESOL, SAPONIFIED, AS A LARVICIDE.

BY C. STRICKLAND, M.A., B.CH.
Professor of Medical Entomology in the School of Tropical Medicine and Hygiene, Calcutta.

AND

D. N. ROY, M.B., D.T.M.
Assistant Professor of Medical Entomology, in the School of Tropical Medicine and Hygiene, Calcutta.

WITH A NOTE ON THE CRESOLS.

BY MAJOR A. D. STEWART, M.B., D.P.H.
Indian Medical Service.
Acting Director of Public Health, Government of Bengal.

SAPONIFIED cresol as a mosquito larvicide has been investigated by Delmege (1919), who found that a dilution in standing water of $1/10^5$ and in streams of $1/10^3$ was effective, larvæ disappearing in the former for ten days and in the latter for five: moreover cresolizing tanks or wells was not detrimental to animal or plant life.

Mayne (1924) reported even more wonderful results with the fluid, the outstanding features of which were: (*a*) the relatively enormous dilutions which sufficed to kill the larvæ within twenty-four hours, e.g., $1/10^3$ M did so, to those newly hatched; and (*b*) the innocuousness of these high dilutions to man or beast.

In India, Mayne's results would mean that a circular tank 100 feet in diameter and ten feet deep, i.e., a large tank, could be effectively treated for the cost of about two-thirds of a pie for about a week, or say three annas a year, so that it seemed to us very important to confirm his findings, and the following records will show the outcome of the work undertaken, Mayne's corresponding results being placed side by side with ours.

The fluid worked with was supplied by Messrs. Waldie and Co., Ltd., Calcutta, and was stated to be of 18/20 R. and W. coefficiency and cost Rs.3.8.0 per gallon, Mayne's material having been 8/9 R. and W. coefficient. To prepare the dilutions which we used one ounce was taken and added to one cubic foot of water to make a dilution of $1/10^3$, and so in proportion for the others which were required.

The matter is composed as follows:—

(I) Trials of varying dilutions

- (A) On anopheline larvæ: (*a*) in Calcutta water supply water; (*b*) in a river water in Assa.
- (AA) On pupation and ecdysis of anophelines.
- (B) *Stegomyia*, and other culicines.

(C) Field trials.

(D) On larvæ, fish and shrimps.

(II) Dilutions deteriorate on standing.

(I) *Trials of Varying Dilutions.*

(A) *Experiments on Anophelines,* to show the action of varying dilutions on batches of ten anopheline larvæ, *A. rossi* (Giles).

(*a*) Dilution $1/10^3$ in water from Calcutta Corporation Water Supply :—

Experiment	Date	Percentage	Dead after
1	Sept. 29th, 1924	40	1 minute
2	24th	20	2 minutes
3	27th	70	2 ,,
4	29th	50	3 ,,
5	22nd	50	3 ,,
6	29th	90	4 ,,
7	27th	90	4 ,,
8	29th	80	5 ,,
9	24th	80	5 ,,
10	22nd	50	5 ,,
11	24th	100	7 ,,
12	27th	100	7 ,,
13	29th	100	7 ,,
cf. MAYNE		100	2 ,,

(*b*) Dilution $1/10^4$ in same water :—

Experiment	Date	Percentage	Dead after
1	Sept. 23rd	10	5 minutes
2	25th	20	20 ,,
3	25th	30	30 ,,
4	25th	40	40 ,,
5	25th	70	2 hours
6	30th	60	2 hours 30 minutes
7	24th	80	3 hours
8	23rd	80	3 hours 43 minutes
9	25th	90	20 hours
10	30th	80	20 hours 30 minutes
11	24th	90	21 hours
12	25th	100	22 ,,
13	24th	100	24 ,,
14	30th	80	24 ,,
15	30th	80	24 ,,

(*bb*) In Nowgong District (Assam), in Diju River water :—

Experiment	Date	Percentage	Dead after
1	Nov. 6th	0	1 hour
2		50	16 hours
3		100	18 ,,

Experiments (*b*) and (*bb*) show divergent results, inasmuch as in Calcutta after one hour about 50 per cent of larvæ died, while in Assam none died. On the other hand, 100 per cent. of larvæ were killed somewhat quicker in Assam than in Calcutta.

(*c*) Dilution $1/5 \times 10^4$ in Diju River in Assam :—

Date	Percentage dead	Dead after
Nov. 6th	0	2 hours
7th	0	6 ,,
	0	24 ,,

(*cc*) Dilution $1/5 \times 10^4$ with Calcutta water supply :—

Experiments a to y made between October 14 and 20. No larvæ were killed after exposures of one and a half to four and a half hours.

	Date	Percentage dead	Dead after
aa	Oct. 15th	50	19½ hours
ab	15th	50	19½ ,,
ac	14th	0	21 ,,
ad	14th	20	
ae	14th	20	21 ,,
af	20th	70	22 ,,
ag	15th	60	24 ,,
ah	15th	50	24 ,,
ai	14th	10	24 ,,
aj	14th	20	24 ,,
ak	15th	60	24 ,,
al	15th	50	24 ,,
am	14th	30	24 ,,
an	15th	90	42 ,,
ao	15th	80	42 ,,
ap	15th	all dead save 15 out of an uncounted large number	42 ,,
aq	15th	,, ,, 10 ,, ,, ,,	42 ,,
ar	15th	,, ,, 17 ,, ,, ,,	42 ,,
as	15th	,, ,, 8 ,, ,, ,,	42 ,,

(*d*) Dilution $1/10^5$ in Calcutta water supply :—

Experiment	Date	Percentage dead	Dead after
1	Sept. 24th	0	20-30 minutes
2	23rd	0	24 hours
3	24th	20	24 ,,
4	30th	10	24 ,,

(*dd*) Dilution $1/10^5$ in Diju River (Assam) water :—

Experiment	Date	Percentage dead	Dead after
1	Nov. 6th	0	18 hours
2	,,	0	24 ,,
3	,,	0	42 ,,

cf. Mayne, who with these dilutions found 100 per cent. dead after one hour.

(*e*) Dilution 1/M in Calcutta water supply :—

Experiment	Date	Percentage dead	Dead after
1	Sept. 30th	0	24 hours

cf. Mayne, who found this strength killed young larvæ after twenty-four hours.

(AA) *Experiments* to show the effect of varying dilutions on pupation and ecdysis of the adult. (Calcutta water.)

(AA*a*) Dilution $1/10^3$:—

Pupæ survived for eleven hours; cf. larvæ which had died within a few minutes.

(AA*b*) Dilution $1/10^4$:—

Larvæ pupated; some pupæ died within twenty-one hours, others survived twenty-four hours.

(AA*c*) Dilution $1/10^4 \times 5$:—

Larvæ readily pupated and many pupæ survived forty-eight hours.

(AA*d*) Dilution $1/10^5$:—

Larvæ and pupæ not affected.

As our results showed that the fluid was not nearly so toxic to anophelines as Mayne had found, we thought that that might be due to loss of potency during importation into the tropics. For this reason we repeated some of the experiments thirteen months after the original series, with fluid which had been kept all the time in the laboratory, only to find that it had lost no tittle of its potency, as will be seen in this table.

SOLUTION: 1 in 10^3.

Action on Anophelines (*A. rossi*).

Nov. 17th, 1925.				
Experiment 1 ..	20	per cent dead in	2	minutes
	40	,, ,,	2½	,,
	80	,, ,,	4	,,
	100	,, ,,	5	,,
Experiment 2 ..	20	,, ,,	2	,,
	60	,, ,,	2½	,,
	80	,, ,,	4	,,
	100	,, ,,	26	,,

(B) *Experiments on Stegomyia and other Culicines* to show the effect of the drug in varying dilutions :—

Series	Dilution		Experiment	Stegomyia	Died after	Culicines	Died after
(B) *a*	$1/10^3$	Oct. 23rd, 1924	1	100 per cent	1 min.	100 per cent	1 min.
b	$1/10^4$	,, ,,	1	100 ,,	4 ,,	100 ,,	4 ,,
c	$1/10^5$	,, ,,	2	100 ,,	4½ ,,	100 ,,	5 ,,
		,, ,,	3	100 ,,	5 ,,	100 ,,	3½ ,,
		,, ,,	1			0 ,,	3½ hours
						30 ,,	22 ,,
						30 ,,	24 ,,
						Pupation	
			2			0 per cent	3½ hours
						50 ,,	24 ,,
						Pupation	
			3			0 per cent	3½ hours
						70 ,,	24 ,,
						Pupation of 3	

(C) *Field Trials.*

Saponified cresol does not mix quickly with water, so that to obtain the quickest results in the field one should emulsify it in a water-container first.

We found that a strength of $1/10^3$ is not strong enough to kill off all

anopheline larvæ in a breeding-place within twenty-four hours, but culicines are more affected; one throws the fluid into a breeding-place and after eighteen hours no culicine can be found alive while many anophelines are alive.

We found in practice that a dilution of $1/5 \times 10^3$ is useful (!) for clearing a breeding-place of anophelines within twenty-four hours, the cost of this *per annum* for a tank 100 feet in diameter and 10 feet deep working out at about Rs. 3,600 as compared with 3½ annas based on Mayne's findings.

(D) *Experiments on Mosquito Larvæ and Fish and Shrimps* to show the relative action of varying dilutions:—

Dilution	Experiment	Date	Anopheline larvæ	Died after	Fish	Died after	Shrimps	Died after
(D) *a* 10,000	1	Nov. 5th	0 per cent	1 hr.	100 per cent	2 min.	100 per cent	3 min.
	2	6th	50 ,,	16 hrs.				
	3	6th	100 ,,	18 ,,				
100,000	1	5th	0 ,,	42 ,,	100 ,,	2 hrs.		
	2	6th	0 ,,	42 ,,	100 ,,	2 ,,		

(II) *Showing that Dilutions of Saponified Cresol deteriorate on standing.*

(*a*) *On Fish and Shrimps.*

Dilution $1/10^4$.

Nov. 5th	..	Freshly prepared:— Fish died within 2 minutes. Shrimps died within 3 minutes.
6th	..	The above repeated with same result.
6th	..	Solution prepared 24 hours previously:— Fish died within 30 minutes.

Dilutions $1/10^5$.

5th	..	Freshly prepared:— Fish died within 2 hours.
6th	..	Repeated with same results.
6th	..	Solution prepared 24 hours previously:— Fish did not die in it in 24 hours.

(*b*) *On Anopheline Larvæ* (*A. rossi*).

Dilution $1/10^4$.

Freshly prepared:—

Nov. 6th .. 0 per cent dead after 1 hour.
50 ,, ,, ,, 16 hours.
100 ,, ,, ,, 18 ,,
Prepared 18 hours previously:—
0 per cent dead after 2 hours.
0 ,, ,, ,, 8 ,,
0 ,, ,, ,, 24 ,,

(*c*) Thinking that perhaps the reason for the rapid decline in toxicity to both fish and larvæ in stale solutions was due to the admixture with naturally polluted waters, the same experiment was carried out using Calcutta filtered water supply for the dilution (1 in 10^3).

On Anophelines.

Nov. 17, 1925. Solution freshly prepared.

20 per cent. dead in 2 minutes.
40 ,, ,, ,, 2½ ,,
80 ,, ,, ,, 4 ,,
100 ,, ,, ,, 5 ,,

Nov. 18, 1925.

20 per cent. dead in 2 minutes.
60 ,, ,, ,, 2½ ,,
80 ,, ,, ,, 4 ,,
100 ,, ,, ,, 26 ,, (two very big larvæ).

Nov. 20, 1925. Stale solutions prepared 2 days previously.

10 per cent larvæ dead in 45 minutes.
30 ,, ,, ,, 60 ,,
50 ,, ,, ,, 1¾ hours
80 ,, ,, ,, 2 ,,
90 ,, ,, ,, 2¾ ,,
100 ,, ,, ,, 3 ,,

The character of the water diluting the fluid, therefore, has no effect on the loss of toxicity.

NOTES ON THE CRESOLS.

By Major A. D. STEWART, M.B., D.P.H.

The action of the coal tar disinfectants (to which the saponified cresols belong) as larvicides is probably not so simple as it appears at first sight and a short consideration of the factors concerned may be of interest. The fractional distillation of coal tar produces various bodies of which bases, hydrocarbon oils, and phenoloid bodies are the chief. Many of the bases are valuable and are removed for commercial use. The hydrocarbon oils are neutral bodies with little germicidal power, but possessing considerable insecticidal properties.[1] The lighter more volatile oils are more toxic to insect and larval life than the heavier and less volatile oils, which latter in the "film" destruction of mosquito larvæ act almost mechanically as air obstructors, while the light volatile oils in addition to this having an action also actively toxic.

The "phenoloid bodies" form a series of which phenol is the simplest; higher up the series are homologues of phenol, with hydroxyl groups in their rings. The cresols in addition to the hydroxyl groups contain methyl, or methyl groups; the simplest cresols having one methyl group in varying positions (ortho-, para- and meta-). The higher cresols are more complex in the number and arrangement of the hydroxyl and methyl

[1] "Pesterine" so commonly used in plague sanitation for killing fleas in infected houses is of course a case in point. Also may be mentioned a very volatile hydrocarbon oil by-product of the gas plant of the M. and S.M. Railway at Hubli Dharwar District, which substances I used in the Belgaum and Dharwar Districts Plague Operations, 1920-1922, a very good pulicide.—C. S.

groups. The higher monohydric cresols resemble in structure thymol, zylenol, and cavracol. Speaking generally, the lower phenoloids (e.g., phenol) are simpler, more volatile (lower boiling point), more toxic to man, and have less germicidal power than the higher bodies which distil at a higher temperature. A coal tar disinfectant designed as a potent germicide would therefore consist of as small an amount of hydrocarbon oils as possible, and a large proportion of the higher phenoloid bodies (cresol particularly). The fraction distilling over from coal tar at a high temperature would therefore be chosen, and this would contain the higher phenoloids but few of the light volatile oils, an important consideration if the product is to be used as an insecticide or larvicide and not as a germicide.

Does the potency of the phenoloids as larvicides increase as we ascend the chemical scale, as the germicidal power does? So far as I know this point has not been definitely determined but is obviously one of importance in comparing the larvicidal power of different coal tar disinfectants.

The "saponified cresol" used by Drs. Strickland and Roy is a brand of high germicidal value (18/20 Rideal Walker coefficient), whereas Mayne used a brand of lower coefficient (8/9). The latter therefore contained fewer of the higher phenoloid bodies and probably also more of the *lower* more volatile neutral hydrocarbon oils and it is very likely that the more satisfactory larvicidal results obtained were due to this latter fact. The "coefficient" therefore is not an index of insecticidal power, which may actually be inversely proportional to the "coefficient." The difficulty lies in apportioning the relative value of the hydrocarbon oil content and the "phenoloid body" content in the larvicidal power of a coal tar disinfectant.

There remains the question of emulsification. Phenol is soluble in water but acts twelve times more powerfully as a germicide when in fine emulsion, due to "ionic" disruption in Brownian movement. The higher phenoloids are sparingly soluble in water but are highly germicidal in fine emulsion. These facts may probably hold also for larvicidal power. The emulsifying agents used are either soaps or resins (black disinfectant) or albuminous bodies (white disinfectant). Both may give fine emulsions in distilled water, but the emulsion in the "black" class is destroyed by electrolytic agents like common salt, and other salts commonly found in water, while the "white" class retain their fine emulsion at least for a time in the presence of electrolytes. When the emulsion becomes coarse or is destroyed, the germicidal power is greatly diminished or lost, the toxic agencies being locked up in the large globules. If the disinfectant contains "heavy" hydrocarbon oils, the globules thus formed will sink; if "light" they will float. In the former case larvicidal power would be lost, while in the latter it would be at least partially retained as the emulsion congregated at the surface now acts on the larvæ there. But even in "white" disinfectants mixed with water the droplets of the emulsion tend in time to coalesce. In the disinfectant experimented on by Drs. Strickland and Roy, a certain proportion of the coalesced emulsion droplets on keeping

would tend to sink, being formed of heavy oil, and thus the larvicidal power would be reduced.

SUMMARY (MAJOR STEWART'S NOTE).

(1) The germicidal coefficient of a coal tar disinfectant is no sure guide to its larvicidal value.

(2) The proportionate amount and nature of the constituents of a coal tar disinfectant have to be considered in gauging its larvicidal value, viz., the hydrocarbon oils, whether light or heavy, the phenoloid bodies, whether low or high, and the emulsifying agent.

(3) The hydrocarbon oils probably play a much larger part than might be thought, in comparison with the phenoloids.

(4) The comparative larvicidal power of the "phenoloid" series has apparently not been determined as has the germicidal power.

(5) The composition of the diluting water is of importance.

DRS. STRICKLAND AND ROY'S EXPERIMENTS.

(1) The experiments carried out with varying dilutions of saponified cresol in water from the Calcutta Corporation "filtered supply" showed decreasing toxicity the higher the dilution.

1 in 10^3	was	100	per cent	toxic	within	10	minutes
1 ,, 10^4	,,	*ca.* 100	,,	,,	in	24	hours
1 ,, $10^4 \times 5$	,,	*ca.* 100	,,	,,	,,	42	,,
1 ,, 10^5	,,	*ca.* 15	,,	,,	,,	24	,,
1 ,, aM	,,	0	,,	,,	,,	24	,,

(2) Mayne had found his fluid much more toxic than that.

1 in 10^3	was	100	per cent	toxic		in	2 minutes
1 ,, 10^5	,,	100	,,	,,		,,	1 hour
1 ,, aM	,,	100	,,	,,	(young larvæ)	,,	24 hours

(3) The relatively less potency of our fluid could not be explained by it having been kept in the tropics and we found it retained whatever potency it had for over a year.

(4) We found that if dilutions were made in polluted river waters the toxicity in general was much less marked.[1]

(5) The action on culicines and stegomyia was very much quicker than on anophelines.

(6) Pupation is effected at relatively low dilutions and pupæ are more resistant than larvæ.

(7) In field trials a dilution of 1 in 50,000 is the greatest of any utility and this would represent a relatively prohibitive cost.

(8) Fish and shrimps were relatively much more affected than larvæ.

(9) Dilutions of saponified cresol rapidly lose their efficacy whatever be the nature of the diluting water.

REFERENCES.

DELMEGE (1919), J. A., D.P.H., *Journ. Trop. Med. Hyg.*, vol. xxii, No. 19.

MAYNE (1924) (Capt.), R.A.M.C., JOURN. ROYAL ARMY MEDICAL CORPS, vol. xliii, No. 3, 1924.

[1] The explanation of this is suggested in Major Stewart's note on emulsificance of larvicides.

ENTERIC SKIN REACTION.

A Résumé of Recent Papers on the Subject.

By Major D. T. M. Large.
Royal Army Medical Corps.

An inquiry into the literature on this subject was introduced with a view to obtaining a more satisfactory test for the detection of carriers among cooks and other servants (who have to be declared free from infection before engagement) than the present single examination of fæces and urine. "As is well known, the finding of the specific bacilli in the fæces of such cases may present great difficulty and a positive result may be obtained only after upwards of twenty or more examinations carried out over a period of months. Also the result of the Widal reaction frequently fails to afford significant information as to the carrier state" (McKendrick). When to this is added the difficulty experienced in India, of examining samples sent through the post, collected by an ignorant sweeper who may mix the samples, or may even produce one fæces as that of several men, the prospect of any test which can be performed on the spot by the medical officer in charge of the individual is distinctly attractive. This is especially the case if the new test is proved to offer a better chance of giving a positive result.

The following is a résumé of a paper by Dr. McKendrick, of the City Fever Hospital, Glasgow, published in the *Journal of Pathology and Bacteriology*, vol. xxvi, p. 535, with a few notes on a paper by Captain T. O. Thompson, R.A.M.C., in the Journal of the Royal Army Medical Corps, 1921, vol. xxxvii:—

"In 1921 Thompson [1] attempted to institute a cutaneous test for enteric by vaccinating on the arm with ordinary T.A.B. vaccine. From forty-eight cases he concluded that in positive cases a "red reaction" persisted until the fourth day and he commented on the possible value of this test for the detection of carriers.

In 1923 McKendrick investigated the subject using a modified Schick test. His cases were:—

(a)	Enteric cases	14
(b)	Chronic carriers	6
(c)	Inoculated individuals	19
(d)	Old enterics	2
(e)	Controls	360

Method of Test.

A series of four intracuticular punctures is made at vertical intervals of one inch, in following order: (1) *Bacillus typhosus*; (2) *B. paratyphosus* A; (3) *B. paratyphosus* B; (4) Sterile saline. Injections are made as in Schick test with a special syringe with closely fitting piston and needle so as to

overcome the intracuticular pressure and avoid leakage. Oxford cultures are used in doses of 0·06 to 0·08 cubic centimetre according to whether the complexion is fair or dark. A white bleb (six millimetres) appears immediately, with a diffuse pink area round it.

TABLE I.

Case No.	Day of illness	Presence of *B. typhosus*	Skin test
1	13	+	+
	29	+	+
	36	–	–
2	16	+	+
3	23	+	+
	40	–	–
	55	–	–
	70	–	–
4	18	+	+
	36	–	–
5	10	+	+
	28	+	+
	30 to 35	–	–
6	29	+	+
	36 to 43	–	+
	65	–	–
7	15	+	+
	29	?	+
	45	–	–
8	30	+	+
	50	–	–
9	19	+	+
10	9	+	+
	23	?	+
	38	–	–
11	23	+	+
	34	+	+
	55	–	–
12	13	+	+
	36	–	–
13	30	+	+
	35 to 75	–	–
14	9	+	?
	11	+	+
	26	–	–
15	8	+	Not done
	24	–	+
	34	–	+
	44	+	+
	61	–	+
	68	+	Not done
	78	–	–
	110	–	–

Criteria of Results.

(*a*) *Negative.*—In six hours the bleb lost its whiteness, its colour merging into the pink area. Second day: Injection sites slightly raised and crimson from hyperæmia. Colour disappeared on pressure. Pink areolæ surrounded

the blebs. Third day: The pink colour had become brownish. No induration and no tenderness. Fourth day: Skin almost normal.

(*b*) *Positive.*—First forty-eight hours similar to negative except perhaps that the positive appeared darker than the others. Third day: Bleb of a dusky maroon colour, deepest centrally, and disappearing on pressure. Slight induration but not tender. Induration twelve to eighteen millimetres in diameter. This more marked in cases of typhoid carriers than in paras. Fourth day: Most characteristic. While negative result had disappeared, positive showed a swollen indurated plum-coloured papulæ with extensive areola. Fifth day: Characteristic appearance diminishing. Sixth day: Almost normal.

In no cases were general symptoms produced.

Results.

(*a*) *Acute Cases.*—See Table I.

(1) In all cases diagnosis verified by isolating *B. typhosus.*

(2) Positive reactions were obtained only at the site where *B. typhosus* was injected. Group reactions were not presented by any cause.

(3) Presence or absence of fever did not affect the reaction.

(4) In no case which had ceased to respond to the test was there a relapse.

(5) *B. typhosus* was *never* found after a negative skin test (that is, if the skin test is negative, patient is not a carrier).

(*b*) *Chronic Carriers.*

TABLE II.

Case	Number of tests	Period over which the tests were carried out	Remarks
K. O.	9	14½ weeks	All tests positive, but only for *B. typhosus*
M. G.	2	2 weeks	Both tests positive for *B. typhosus* only
H. T.	4	16 weeks	1st test. 7.5.22. Negative 2nd ,, 23.6.22. Results vitiated by hæmorrhage 3rd ,, 23.7.22. Positive for *B. typhosus* and *Para* B 4th ,, 1.8.22. ,, ,, ,, ,,
M. D.	8	14½ weeks	1st seven tests positive for *Para* B only 8th slightly positive *Para* B only
J. M.	1	..	Positive *B. typhosus* only
J. H.	3	6 weeks	1st two tests positive *B. typhosus* (only), last negative

All these cases excreted the organisms over a period of one to one and a half years and their acute illness occurred four years before, in all cases.

In case H. T. both *B. typhosus* and *B. paratyphosus* B were found.

(*c*) *Inoculated Individuals.*—Nineteen such cases were all negative.

(*d*) *Individuals with History of Enteric.*—Two in number. Both negative.

(*e*) *Control Cases.*—360 in number. No history of inoculation or of

enteric. All negative except two children, aged 2 and 8, in whom no other evidence of typhoid infection was found.

Significance of Area of Induration.

A positive result should not be registered unless a definite inflammatory reaction with hyperæmia, as shown by the maroon colour at the site of injection, along with induration, is present on the fourth day. Induration alone was frequently present for several days following the injection.

Conclusions.

(1) A method of testing for hypersensitiveness of the skin to the organism of the typhoid group is described and the criterion of a positive reaction is defined.

(2) According to the procedure employed, positive reactions were very constantly obtained in patients suffering from enteric fever and in chronic carriers.

(3) The test appears to be highly specific: the acute cases in which typhoid bacilli had been demonstrated in the fæces reacted only to *B. typhosus*. Four chronic carriers of *B. typhosus* and one of *B. paratyphosus* B reacted only to the corresponding type of organism. One reacted to *B. paratyphosus* B as well as *B. typhosus*; *B. typhosus* was repeatedly obtained from her fæces; but *B. paratyphosus* B was found only on rare occasions; on operation *B. typhosus* alone was isolated from the gall-bladder contents; this patient's serum also showed an abnormally high agglutinating power for *B. paratyphosus* B.

(4) Only two out of 360 control cases gave positive reactions for *B. typhosus* and none was positive for the paratyphoid bacilli.

(5) There was no correspondence between the result of the skin test and the presence of pyrexia in acute cases, or between the skin test and the Widal reaction in carriers.

(6) The result indicated that in convalescence from enteric fever the skin test becomes negative. It is noteworthy that in a case which, while apparently convalescent, continued to react positively; two relapses occurred; after the second relapse the skin reaction became negative. In a patient suffering from pneumonia who had convalesced from enteric fever within a year previously there was a positive skin reaction and typhoid bacilli were still present in the fæces; disappearance of organisms from the fæces and the conversion of the skin reaction to negative occurred during convalescence from pneumonia.

(7) It is suggested that patients who are convalescing from enteric fever should be examined for the skin reaction. A positive result probably indicates persistence of the infection which may result in relapse or in the carrier state.

(8) Negative results on single examinations should not under any

circumstances be taken to exclude infections with organisms of the typhoid group.

(9) A positive skin reaction in persons apparently in good health suggests that they are enteric carriers. The skin test when positive appears to be of great value for the detection of carriers, since the Widal reaction may afford little aid and the isolation of organisms may not be rapidly successful.

This work was done in connection with the investigation on enteric carriers carried out for the Medical Research Council at the Pathological Department of the University and Western Infirmary, Glasgow.

REMARKS.

This is a subject which has attracted many workers. Originally described by Chantemesse [2] in 1907, the skin hypersensitiveness to enteric infection was examined and described by Austrian [3] in 1912; Link [4] in 1908; Chauffard and Troisier [5] in 1909; and by Gay and Force [6] in 1914, to mention only a few names.

The latter two workers used a substance called typhoidine obtained by evaporating down a glycerine broth culture of *B. typhosus*. Of 18 normal persons tested with this, 17 reacted negatively; of 26 with a history of typhoid fever 19 were positive and in the case of the seven negatives the history was doubtful.

Thompson in 1921, while working in the E. C. D. Wellington, was the first to comment on the possible value of the test in looking for carriers. He applied several loopfuls of killed cultures (usually T.A.B. mixed vaccine) to the cleansed skin and scarified an area of about one inch through this. He concludes his article as follows:—

" The reactions and findings of the experiment, taken as a whole, are apparently reliable and satisfactory, but the numbers available (forty-eight) are very small, and it would be interesting to see the results of a much larger number for corroboration.

"The experiment appears to offer an easy and quick method for the detection of the enteric group carriers, and possibly for the diagnosis in late stages of of the disease, by the use of separate cultures of *B. typhosus*, *B. paratyphosus* A, and *B. paratyphosus* B. This point, however, requires further testing on a number of cases. The test should prove valuable, when thoroughly corroborated, in finding the carrier source of sporadic outbreaks of enteric group fever in any community, either military or civil, since all possible sources can be readily tested and suspicious cases ear-marked for further investigation. It should simplify the examination of the kitchen staff of any establishment either prior to engagement or during routine examinations. It should also be a considerable help in enteric and other convalescent depots for the rapid detection of enteric carriers and the early return of non-carriers to their own units, especially during urgent demands of Active Service."

Remarks on above résumé :—

If these results can be corroborated by us in India, we have here a test far surpassing in value the present method of detecting carriers, not only amongst prospective servants, but amongst those individuals who are suspected of being carriers when the causation of a case of enteric is being investigated.

It is stated that the reaction is more easily observed in fair people than in dark, and that, therefore, a larger dose (0·08 cubic centimetre) is required in those of dark complexion. There is no record of the test having been attempted on Indians, and it is possible that their colour may interfere with the proper interpretation of the results. This would especially be the case with barrack servants who are usually of very low caste and very dark in colour. Investigation of a number of cases would soon clear up this point.

An important point in favour of this test is that inoculated individuals and old enteric cases (not carriers) gave negative results. The test can thus be applied on anybody.

McKendrick states that negative results on single examination should not under any circumstances be taken to exclude infection with organisms of the typhoid group. In only one of his cases, however, was a negative skin test disproved by finding the organisms in the fæces. Case H. T., Table II. Further skin tests on this patient were all positive.

Because of this one case, however, further investigation is required, and this might easily be adapted so as to include organisms of the dysentery group in the test. It is becoming evident that bacillary dysentery is more common in India than was originally supposed, and it is well-known that carriers of bacillary dysentery are very liable to be missed, except after prolonged testing. It is possible that the new antidysentery vaccine now being tested may be the most suitable emulsion to employ.

If such investigation gave further proof of the value of the test, prospective barrack servants would be examined by intracuticular injection of say mixed T.A.B. vaccine, mixed antidysentery vaccine and a saline control.

LITERATURE.

[1] Thompson. Journal of the Royal Army Medical Corps, 1921, xxxvii, p. 302.
[2] Chantemesse. *Bull. Acad. Med.*, 1907, 3rd Sect., lviii, p. 138.
[3] Austrian and Bloomfield. *Arch. Int. Med.*, 1916, xvii, p. 653.
[4] Link. *Münch. med. Wochenschr.*, 1906, lv, p. 730.
[5] Chauffard and Troisier. *Compt. Rend. Soc. Biol.*, 1909, p. 471.
[6] Gay and Force. *Arch. Int. Med.*, 1914, xiii, p. 471.
[7] Kolmer and Berge. *Journ. Immunol.*, 1916, p. 409.
[8] Nichols. *Journ. Exper. Med.*, 1915, xxii, p. 780.
[9] Zupnik. *Münch. med. Wochenschr.*, 1908, lv, p. 148.
[10] Floyd and Barker. *Amer. Journ. Med. Sci.*, 1909, cxxxviii, p. 188.

A CORRESPONDENCE CIRCLE.

XV.

THE MEDICAL SERVICE OF THE ROYAL NAVY.

COMMUNICATED BY MAJOR M. B. R. RITCHIE, D.S.O.
Royal Army Medical Corps.

I AM indebted to a life-long friend of distinguished professional attainments, at present Surgeon Commander in the Royal Navy, for the following note on the medical service of the senior arm. When serving in Malta, the Royal Army Medical Corps officer has opportunity to meet his naval colleagues and gain an impression of their work. They outnumber us considerably at this station—very naturally, as Malta is a most important naval base—and they have accorded us the privilege of honorary membership of their medical society. At these meetings one cannot fail to be struck by the high standard of professional skill which exists in our sister Service, by its advanced team-work, and by the professional organization that is necessary in the combating and treatment of disease in the Fleet. Their problems differ from ours in several particulars, organization of the Service rests upon another model, but fundamentally we are out on the same quest. In Turkey in 1922-23 we were able mutually to assist each other, and the books of our hospitals there bore the names of many members of the Royal Navy who were admitted for treatment. One got an idea that the creation of an Imperial Medical Service for all arms might be a simpler undertaking than many would believe—if the powers that be willed it.

The aspirant for the medical service of the Royal Navy joins as an Acting Surgeon Lieutenant, with two stripes upon his arm. He goes to Haslar for six months and there learns routine, discipline, regulations, and the customs of the Service. He is instructed in hygiene, tropical diseases, and X-rays; also in general medicine and surgery.

Prior to the war, there was an entrance examination on a competitive basis for entry, and another on passing out of Haslar. The results of the two examinations were added together, and seniority was determined on the combined marks. This plan will probably be adopted again at an early date.

At the termination of this course the officer becomes Surgeon Lieutenant, and remains so for six years. Every effort is made to ensure him at least one year's hospital experience within that period. Apart from the professional benefit that he acquires from this, his tendencies towards specializing can be better assessed for future reference. Probably, however, his professional education is widened by holding appointments as senior medical

officer of small ships, or destroyer flotillas, frequently in remote parts of the world, away from help and relying on his own initiative. He also serves for some time in a big ship, under the administrative orders of his senior medical officer, or the squadron medical officer.

After six years, he is promoted Surgeon Lieutenant Commander, and at some period during the next six years he goes to Greenwich for a five months' course in medicine, surgery, and tropical medicine. These are taught at the London Hospital and the School of Tropical Medicine, while at Greenwich itself instruction is carried out in public health, bacteriology, and a few special subjects.

At the end of this course comes an examination. A candidate passing with over 75 per cent in all subjects can obtain a year's seniority, and the officer at the top of the list gains the Gilbert Blane Gold Medal. A candidate who fails is given one more chance; if he should fail a second time, he has to retire with a small gratuity.

After twelve years' service and the promotion examination having been passed, an officer is promoted to Surgeon Commander. Two general lines are now open to him. He may prefer to remain at sea, or he may go to shore establishments, such as gunnery schools, torpedo schools, barracks, etc.; or he may obtain a hospital appointment, being recognized as specializing in a definite subject, according to his tendencies, past services and experiences, and according to the nature of any qualifications he may have acquired over and beyond the prescribed service examinations.

During this period he is given a senior officers' course, which is a more elastic affair than that for the promotion examination. He can take it in medicine, surgery, or in any special subject as, for example, ophthalmology. The course is of three months' duration, which is considered to be too short. An officer attending it is in plain clothes and detached temporarily from the Service, being more or less his own director, advised and assisted by the educational authorities at Greenwich.

At one time or another, medical officers of the Royal Navy have to go through a gas course, as the exigencies of the Service permit.

It is difficult when serving in the Navy to find facilities for obtaining additional degrees and qualifications. Nevertheless, it is a striking fact that many men do so, either when unemployed or through snatching the opportunity at the end of a course. It requires initiative, money and management; officers must not be too much disappointed if baulked in their efforts by some Service exigency, or if required for special duty.

Before taking up hospital appointments, officers are frequently given a refresher course on their special subject, especially when they have been at sea for some time previously.

Subsequent promotion above the rank of Surgeon Commander is by selection, into which other considerations enter, such as administrative capacity.

With regard to the special subjects recognized in the Royal Navy, these are medicine, surgery, hygiene, ophthalmology, ear, nose and throat diseases, genito-urinary diseases, radiology, anæsthetics, bacteriology and physical training. The holders of these special appointments are paid 5s. *per diem* extra.

A new scheme of general and specialist courses will be inaugurated in the near future. The scheme provides for courses for all officers every four years. The general courses will be taken at Haslar Hospital, under the direction of the Professors of Medicine and Surgery, and the specialist courses will be taken at a civil hospital, under the general direction of the Professor of Medical Studies, Greenwich Medical School.

Editorial.

EXPERIMENTAL EPIDEMIOLOGY.

For some years we have believed, in conformity with bacteriological findings, that infectious diseases are caused by animal and vegetable parasites and that the development of an epidemic is largely conditioned by circumstances affecting the host and the parasite. The pressing problem at the present day is to harmonize bacteriological findings with clinical data; to explain why outbreaks of infectious disease appear at intervals in our great cities, and why waves of epidemic disease in certain years spread throughout the whole country. Why does an epidemic slowly gather force? Is it because a parasite normally present with us has become more virulent or because the host is less resistant? Is the decline of an epidemic due to a falling off in the virulence of the parasite, or to the exhaustion of susceptible material? Does a host escape manifest disease owing to natural or acquired resistance, or merely by chance? Is there any change occurring in the population at risk in the pre-epidemic phase?

Attempts to answer these and similar questions have been made by studying numerical data and by observations on human beings in epidemic and pre-epidemic phases, as a result of which we have learnt something about the carriers of disease. We now know, for instance, that people may harbour virulent diphtheria bacilli and may become actively immune without having diphtheria. During the late war we learnt that as regards cerebro-spinal fever the carrier state may be observed to rise from 2 to 5 per cent to 20 per cent or more before a single case of meningitis occurs and that the actual number of cases may be few among thousands at risk. It seems probable that poliomyelitis and encephalitis lethargica behave in a similar manner, and that in many infectious diseases the distribution of the parasite is far wider than the distribution of disease.

Progress in these investigations is extremely slow when they are limited by resource to the human element; observations on human beings can be carried on for a limited period only and under conditions circumscribed by humanitarian considerations. It is otherwise with animal experiments; they can be continued indefinitely and the population at risk varied at will. Epidemic outbreaks of disease occur among animals and pursue a course similar to that which has been observed in man. The study of epidemics among animals under conditions which can be controlled is therefore of profound interest to the epidemiologist. By this means it should be possible to secure precise data on which a real science of epidemiology can be built.

The possibility of employing artificial epidemics among small rodents

for the study of the spread of infectious disease really dates from the experiments of Danysz, published in 1900.

Seven years ago Topley commenced his observations on bacterial infections in mice, and these have been continued up to the present time, the later studies having been made in conjunction with Dr. Greenwood. In 1922 Amoss published in the *Journal of Experimental Medicine* his experiments on artificially induced epidemics of mouse typhoid, and Webster his studies of the bacillus of mouse typhoid. Since then Webster, Pritchard, Lange and Neufeld have contributed papers on the same subject. We realize that the results of mouse experiments cannot be applied without qualification to human epidemics, but many results have been obtained which are very suggestive in relation to human disease and we believe that a summary of the main points brought out in the recent researches will prove of interest.

Professor Topley, in his recent Milroy Lectures, states his belief that the origin and spread in any epidemic of microbial infection depends upon variations in the normally existing relations between living organisms and that the actual outbreak of disease is only the end-result of a progressive disturbance of this normal equilibrium. In conjunction with Dr. Greenwood he has studied mouse typhoid and mouse pasteurellosis. In most of the experiments normal mice were added to others which had been infected by feeding with the bacterium to be studied; in other experiments the infecting mice were survivors from previous epidemics; sometimes the normal mice were added in a single batch, at other times daily additions were made.

The introduction of a few infected animals did not at once give rise to an epidemic of disease; in the pre-epidemic phase there was a change in the equilibrium between parasite and host, and it was only when a certain limited condition, which Peters in his study of epidemic diarrhœa has called epidemic potential, was reached that an epidemic was initiated. As regards the epidemic phase of mouse typhoid, when susceptible animals were added to a cage at a steady rate the deaths were grouped in a series of waves, successive maxima and minima being separated by intervals of thirty to forty days. The experiment could be continued for nine months and there was no evidence that the process had any actual limit in time. When the number of susceptible animals added was small the waves were separated by great intervals, often lasting several months. When the number added was large the waves were fused together into a relatively high and steady death-rate. The addition of large batches of susceptible animals at irregular intervals appeared to cause a lower average death-rate than that which followed the frequent and regular addition of small batches, even though the population at risk was larger in the former case than in the latter.

It was unusual for an epidemic spreading among an isolated herd to lead to the death of all the animals at risk; when, however, an epidemic was

continued for a long time by the addition at a steady or irregular rate of susceptible animals, all the mice alive on any particular date ultimately succumbed to the specific infection.

It appears that a steady circulation of susceptible animals is a more important factor in favouring the epidemic spread of disease than the total number of mice exposed to risk; and in general that the movement of susceptible but uninfected animals is one of the main factors in determining the course and duration of the epidemic spread of bacterial disease.

In Topley's experiments, "all mice at risk were housed in a single cage, thus ensuring as uniform an admixture as possible of the individuals within the experimental herd." He did not endeavour to imitate the conditions existing in natural epidemics. The study of bacterial infections as it occurs in nature is particularly difficult, because the number of relevant factors is so large and unpredictable that the conditions necessary for arriving at any valid generalization are almost unobtainable. The value of the experimental method lies in the possibility of limiting the number of unknown factors.

Amoss created a mouse village consisting of a large number of separate cages each containing five mice. The epidemic was started by feeding a small number of mice on a culture of mouse typhoid, probably *Bacillus pestis caviæ* Smith, or mutton *ærtrycke* of Schütze. The spread of infection so induced, to the other cages was left to accident through the agency of the attendant who fed the animals and cleaned the cages. Sporadic cases first appeared; the introduction of fresh normal mice into the community led, not to further extension of sporadic deaths, but to an epidemic, which began with deaths among the new mice and extended to the old mice later. A state of equilibrium then followed and no more deaths occurred. If, however, fresh mice were introduced into the potentially infected community the events were re-enacted and another epidemic swept through the population. Wave after wave could be produced until certain groups of old survivors were wiped out. Amoss did not attempt to create the optimum conditions for infection, but imitated those occurring naturally in man and in laboratory animals.

The main factors underlying the course of events described by Topley and Amoss appeared to be the parasite and the host, but the presence of other bacteria giving rise to double infections, variations in diet, ingestion or inhalation of toxic substances and insect vectors may also play a considerable rôle in the production of epidemic disease.

The dosage and the virulence of the parasite may vary; the dosage in herd experiments cannot be accurately measured as in a bacteriological experiment, and can only mean the chance of individuals among the population at risk receiving, within a given time, a given number of bacteria. Lockhart, Amoss, Webster, Neufeld, Lange and Topley have studied the question of dosage. Lockhart has found that when the organism has been given *per os* or by intraperitoneal injection, large fluctuations in

dosage over a wide range may make relatively little difference in the resulting percentage mortality. Amoss regards variation in dosage as largely determining the course of mouse typhoid. The contraction of disease by the more susceptible mice undoubtedly increases the risk of infection of other animals in the cage.

In Topley's experiments the daily excretion of *B. ærtrycke* by each mouse was measured in a herd in which mouse typhoid was spreading, and to which one normal mouse was added daily. The main wave of mortality was preceded by a considerable interval, during which there was a marked rise in the excretion rate, and this rate fell when the epidemic was gaining in force.

Dudley makes the important suggestion that velocity of infection may play a part in the spread of epidemic disease. For most infectious diseases there is a minimum dose of the infecting agent, varying with the host and the parasite, necessary to cause a particular disease. If a dose smaller than the minimum infecting dose is received by an individual, it is destroyed by the defensive mechanisms of the body. But Dudley suggests that "if a subject receives a number of sub-minimal doses, which, when totalled exceed a minimum infective dose, it is reasonable to suppose that it must depend on the rapidity with which these fractional doses are received as to whether or not he falls a victim to the disease in question, that is to say, as to whether the rate at which the doses of infective agent can be dealt with is greater than the rate at which they are received." From a study of the spread of disease in ships and elsewhere Dudley concludes: "that in many bacterial infections it is more often the rule than not for an infective dose to be collected by degrees rather than received as a whole in one moment of time."

As regards virulence, Webster concluded from his experiments that the epidemic curve of mouse typhoid is explicable solely on the basis of bacillary distribution and host susceptibility. Successive animal passages of the particular strain of *B. pestis caviæ* Smith did not modify its infective capacity or virulence. Lockhart and Topley's experiments appear to indicate that considerable variations in the virulence of *B. ærtrycke* may occur, but whether such variations play any rôle in the spread of mouse typhoid is not yet clear.

Studies of herd resistance have been made by Amoss and by Topley, and it has been found that the survivors from a previous epidemic show a greater resistance to infection than newcomers; but towards the end of the secondary wave which follows the introduction of fresh mice, the survivors also succumb to the disease, showing that their resistance is not sufficient to ensure their survival over a more prolonged period. Though the average resistance of the survivors of a herd after an epidemic of mouse typhoid is shown to be increased, it is an interesting question whether the herd immunization has resulted from selection, from the elimination of more susceptible animals, or whether some individuals passed through an

immunizing process. It is probable that the processes are combined; it has not yet been proved that the natural resistance of mice to a particular bacterial infection would lead to a selective increase of the average herd resistance. There is some evidence that the survivors from an epidemic have been immunized as they have been able to withstand a dose of *B. ærtrycke* sufficient to kill the controls; but animals which have survived experimental inoculation have not escaped infection as many of them are still found to be harbouring the causative microbe. It is therefore probable that active immunization following non-lethal infection plays a considerable part in the increase of the average herd resistance, which follows exposure to an epidemic of mouse typhoid infection.

Topley made some interesting experiments on the effect of dispersal or redistribution of an infected herd; he wished to ascertain whether the dispersal of the population at risk after the admixture of susceptible and infected animals would prevent an epidemic or bring the wave of mortality to an early close. He found that while dispersal of the population at risk into large groups during the pre-epidemic phase had little influence, dispersal into small groups had a marked inhibitory effect. Dispersal into small groups during the epidemic phase had not such a marked effect as when the redistribution was carried out before any wave of mortality had developed. Dispersal became less effective as the wave of mortality reached its crest, and once the wave began to subside it appeared unlikely that dispersal would have any appreciable influence on the further course of the epidemic.

These results are of particular interest in connexion with the observations which have been made on the effect of school closure in rural areas. When an infected population is dispersed it is largely a matter of chance how many infected individuals will be found in any small group. The spread of infection in some groups may be intensified by frequent contact with very infected companions, but these infected members will not become centres of distribution to large numbers of their companions. In towns where the chance of small dispersed groups meeting is greater the effect of early dispersal is not likely to be so marked. It would seem that for the development of a high epidemic potential full play must be given to the effect of chance associations by the maintenance of the population at risk at a reasonably high level.

Experiments have been made on the effect of vaccinating mice with killed cultures of *B. ærtrycke* with the object of increasing their resistance and so limiting the spread of epidemics of mouse typhoid. The results suggest that immunity of this type must be conferred in the pre-epidemic phase if it is to be successful; in the later stages of an epidemic vaccination may do more harm than good.

Discussing some general considerations on the epidemic spread of disease, Topley points out that during the observation of naturally occurring epidemics bacteriological data have been obtained along two lines of

14

inquiry. The first relates to the carrier problem and the distribution of parasites among the population, the second relates to the distribution of the resistance of the population at risk. As regards the carrier problem, contacts with atypical lesions, healthy contacts and healthy non-contacts generally show the presence of the specific parasite in a descending order of frequency; yet in many cases we may obtain equal values for the carrier rate in healthy contacts and non-contacts within an epidemic area, so there is no reason to suppose that contact with a clinically recognizable case of disease is the main mode of infection leading to the carrier state.

We have already pointed out that bacteriological investigations made during the war revealed the fact that in cerebro-spinal fever the number of carriers far exceeded the number of cases, and as regards poliomyelitis and encephalitis lethargica it seems probable that a similar relation between carriers and cases obtains. Diphtheria and scarlet fever show a higher ratio of cases to carriers, while in small-pox carriers are probably in an insignificant minority.

As regards the study of the resistance to infection of the individuals composing the population, the introduction of the Schick test has enabled us to do this in the case of diphtheria, and the work of the Dicks seems likely to give us similar information in the case of scarlet fever.

The clue to the control of the spread of epidemic disease seems to lie in the determination of the various factors which lead, either to a non-fatal infection and the gradual accumulation of resistant individuals, or to the development of cases of disease, many of which may terminate fatally. It is hoped that the experimental inquiries now being made will furnish us with definite information as to the nature of these factors, the removal of even one of which would probably enable us to break some link in the chain of events which gives rise to the spread of epidemic disease.

If we now consider the administrative measures which are usually employed to lessen the chances of contact between infected and susceptible individuals, the first which claims our attention is the isolation in hospital of cases of infectious disease. It is natural to suppose that the removal of a case to hospital will diminish the risk of infection to the few cases brought in contact with it, but the question we have to answer is whether this method is of such importance as to have a marked influence on the general spread of epidemic disease. In the case of such a disease as cerebro-spinal meningitis, where in the pre-epidemic phase there is a wide diffusion of the infecting microbe among the population before the development of actual cases, it seems unlikely that isolation in hospital of the cases will have much effect on the course of the epidemic. In the case of diphtheria and scarlet fever, removal of cases to hospital has been practised for many years, but an examination of the notification returns for diphtheria and scarlet fever in England and Wales shows that, except for periodic rises and falls, during the fourteen years, 1911-1924, there has been no real diminution in the number of cases of these diseases. The case mortality

for diphtheria has, however, been reduced and there seems little doubt that treatment in hospital combined with the use of antitoxin has been largely responsible for this reduction. The total deaths and death-rates for scarlet fever have notably declined in the last thirty years, and these results with some reason may be partly attributed to the increasing extent to which hospital treatment of the disease has been provided and utilized. The provision of isolation hospitals may, therefore, be defended on the ground of the benefits which they confer on the sick, but as a means of lessening the general incidence of infectious disease they have not been as effective as was anticipated when they were first instituted.

In recent years much time and money has been spent on the detection and isolation of carriers. Our experience during the war showed that as regards cerebro-spinal fever the hunt for carriers was really an impracticable measure from the point of view of arresting the spread of an epidemic of the disease. In many other diseases and certainly when an epidemic is widely diffused among an uncontrollable population, the detection and isolation of carriers is not a practical proposition.

In institutions and barracks, however, where the population can be controlled, experience has shown that detection and isolation of carriers offers a reasonable prospect of arresting infectious disease.

Administrative sanitary measures which ensure clean milk, clean food and pure water, which reduce the frequency of insect vectors of disease, or which diminish close contact between individuals, cause a reduction of the incidence of diseases which are transmitted by these particular channels. The influence of overcrowding on the spread of disease was realized by the Commission which was appointed after the Crimean War, and their recommendation of six feet of wall space for each soldier, a minimum space of three feet between beds, has always been insisted upon by Army sanitarians. The neglect of this advice during the war undoubtedly increased the incidence of cerebro-spinal fever and respiratory diseases.

Topley suggests it might be helpful to adopt a bacteriological definition of overcrowding, as any special distribution of a population which favours the frequent transference of a particular pathogenic microbe from host to host. He says that while concentrating on such statistical definitions as number of houses per acre, number of families per house, or number of persons per room, ample opportunities for the transference of parasites still exist in our trains, trams and buses, and that as regards respiratory diseases reduction of overcrowding in houses may not have as great an effect as would be anticipated.

In densely crowded trams, buses, etc., it is possible that a massive infective dose may be received which will at once overwhelm the defensive forces of the body. A study of scarlet fever and diphtheria in the Royal Naval School at Greenwich has, however, convinced Dudley that comparatively short, though intimate, contact in class and playrooms is not so likely to cause the spread of these diseases as prolonged association in dormitories.

Glover also found that by increasing the space between beds in barracks, the carrier rate of epidemic strains of the meningococcus could be gradually reduced until it fell to the normal level, and as a result cerebro-spinal fever was absent in the epidemic season for the first time in three years.

Our best hope of controlling infectious diseases which do not yield to general measures of sanitation, seems to lie in devising more effective means of immunization and so raising the average level of resistance of the population at risk. The use which is now being made of the Schick test in diphtheria is an excellent example of the application of scientific methods to the prevention of disease.

We cannot, of course, contemplate vaccination of the public at large for every infectious disease to which it may be exposed, but Topley points out that any outbreak of infectious disease is probably preceded by a redistribution of the specific parasite among the population, and a knowledge of such a redistribution will yield valuable indications as to the appropriate measures to be adopted.

Clinical and other Notes.

A CASE OF TRANSPOSITION OF VISCERA.

By Major W. E. C. LUNN, M.C.
Royal Army Medical Corps.

Private M. arrived at his regimental depot from a provincial recruiting centre and came under the usual medical re-examination. No sign could be found of the heart being present in the normal position. The heart

Fig. 1.—Showing transposition of heart and liver.

impulse was in the fifth interspace on the right side of the chest, one inch inside the nipple line. The heart sounds were clear and well conducted into the right axilla. On percussion, no heart dullness could be demonstrated on the left side and the cardiac dullness was not very definite on the

right. Liver dullness was absent from the right side, but dullness corresponding to the usual liver limits was present on the left side. The patient was X-rayed later at Netley by Captain A. K. Robb, R.A.M.C., whose excellent photographs, taken facing the patient, well illustrate the condition.

Fig. 1 shows clearly the transposition of the heart and liver; the lighter patch seen below the lower border of the heart is due to the presence of gas in the stomach.

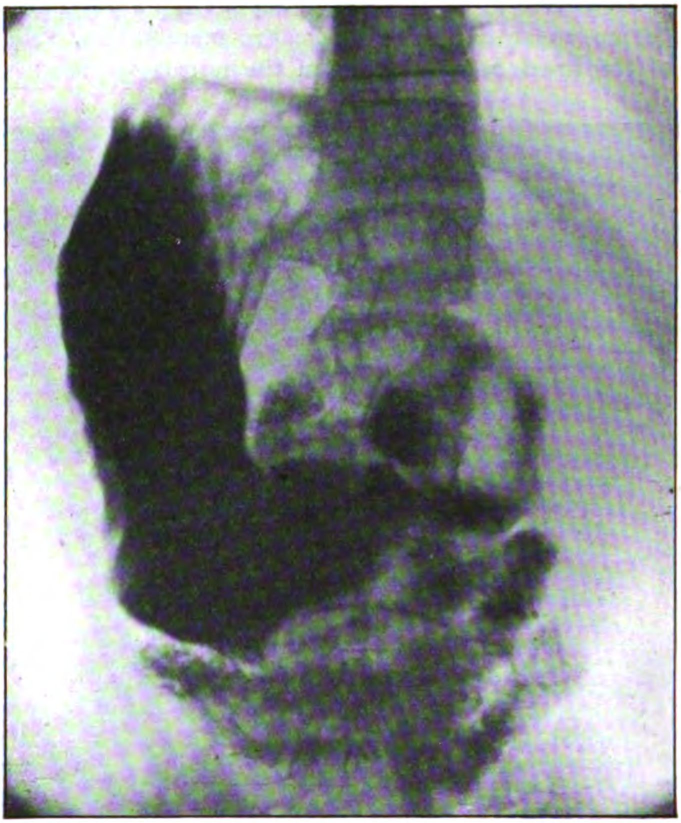


FIG. 2.—Taken immediately after a barium meal.

Fig. 2, taken immediately after a barium meal, shows the stomach on the right with its pyloric orifice to the left.

Fig. 3 was taken six hours after the barium meal and shows the full cæcum definitely on the left, the ileum emptying its contents into it from the right. There is still a small amount of the barium meal in the most dependent part of the stomach, vide the shadow above the ileum.

Apart from this anatomical peculiarity the recruit is physically up to the standard of the other recruits. Previous to joining the Army he was at

a boys' home for two years; the superintendent of the home informs me they had no knowledge of his condition and that he was always well there.

His family history is, as far as I can ascertain, negative, his father was a soldier and he has two brothers serving in the same regiment now. He is right-handed.

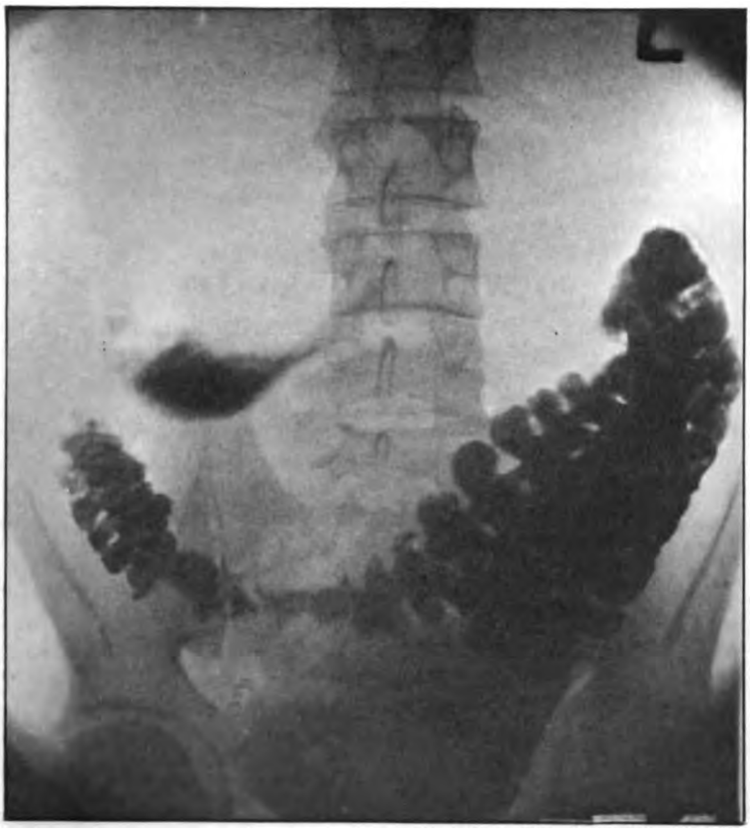


FIG. 3.—Taken six hours after the barium meal.

The American heart specialist, Hirschfelder, makes the following comments on this condition in his book, "Diseases of the Heart and Aorta": "It is not extremely rare to meet with a case of complete transposition of the viscera, so that the heart and stomach are found to lie on the right side, and the liver on the left. This condition is probably brought about by a change in position of the cardiac tube in early embryonic development, so that it lies in the position of **Z** instead of the normal **S**. Maude Abbott suggests that in these cases the embryo lies in an abnormal position within the chorion, so that its right side instead of its left is closer to the blood-

supply. At all events the relation of the organs is the mirror image of the normal condition. In complete transposition however, the organs develop normally and the condition, though unusual, has no effect upon the function.

"Persons whose hearts lie on the right side are quite as free from symptoms as those whose hearts are on the left, provided the other viscera are normal; and the condition is usually discovered accidentally during routine physical examination. The electrocardiograph shows sometimes inverted waves, sometimes a curve that is practically normal. Dextrocardia without transposition of other viscera is much rarer."

Travel.

JOTTINGS FROM A DIARY.

By Lieut.-Colonel C. R. L. RONAYNE (Retired Pay).

(*Continued from p.* 144.)

Monday, January 28.—At Colombo, about eighteen passengers disembarked, and we took on about the same number transhipped to us from the P. and O. "Narkunda" which arrived from Australia. After an uneventful voyage we arrived at Madras at 2.30 a.m. this morning.

As one of the "Novara's" boats had been lowered, I took her out and skulled her about the harbour, and then into the inner harbour, and eventually found myself at the Madras Yacht Club. As I approached the quay of the club I noticed a coolie standing there with a parcel under his arm, and, as he kept staring at me, I asked him what he wanted. He said he had brought cigars. And on asking him who they were for, he said for me. I was still some distance from the quay, and was utterly puzzled for an explanation. Could it be, I thought, that the Hon. Sec. of the club from his verandah saw me approaching, and sent the cigars as a sort of present of welcome. I could not think of any other explanation; and it was, I thought, an exceedingly nice and felicitous thing for him to do. But on thinking the matter over I said to myself, after all, I am a complete stranger to the Hon. Sec., and why should he send cigars to anybody who happens to approach his club in an ordinary ship's boat as I have done. So I questioned the coolie further, and it then turned out that in the early morning when we arrived, I had ordered cigars from Spencer's (the well-known Madras manufacturers) and the coolie brought them to the ship just as I was pushing off in the boat, and he kept me in sight, and trekked round the quays until eventually he met me at the Yacht Club.

This was rather a prosaic ending to the felicitous present from the Hon. Sec. I pictured, but after all it never occurred to me that cigars I ordered

on board ship would be delivered at a club where I happened to arrive in a casual way.

The Yacht Club is an extraordinarily pretty and well-equipped little club. There it is, literally within a stone's throw of "where the broad ocean leans against the land," yet so snugly situated there is not the least trace of a swell or ripple. The yachts consist of four "Bembridge" boats, several Dublin Bay "water-wags," and a few motor boats.

The racing I am told is very good and keenly contested. A very interesting relic of the war is the site of the hole in the club wall where a shell from the "Emden" pierced when she was shelling the petrol tanks close by. A framed yachting picture hanging on the wall has some splinters of shell embedded in it.

Madras. In the foreground are the grounds and portion of the verandah of the Madras Sailing Club.

In the afternoon went with W. in a taxi to the aquarium. This is one of the very few "sights" of Madras, and it is well worth a visit. Such an extraordinary and wondrous collection of tropical fish, many of them uncanny in their colouring, shape and movements. We dropped the taxi and walked back by the sea front, past Fort St. George.

The last time we called at Madras (a few months ago) I looked up in the Fort my old friend Gibson. He provided an enjoyable "four" at tennis at the Madras Club, but as the place was rather crowded we shifted to the Fort and played there undisturbed.

Unfortunately I could not accept their invitation to dinner as we were leaving that night. Much to their delight, but to my regret, they have

since been shifted to Wellington, which, I believe, is a very desirable hill station.

There is a good deal of similarity between Fort William in Calcutta and Fort St. George in Madras. In fact, in general construction I think they must be almost identical, except that Fort William is a good deal the larger. The Madras Fort was built in 1750, and the Calcutta one, which was not commenced until seven years afterwards, was evidently modelled on it; it is the largest fort in India, I believe, and took sixteen years to build, at a cost of £2,000,000. It covers an area of two square miles. Both forts are in excellent preservation, and, with their mighty ramparts and bastions and well devised moats, would do credit to engineers of any age.

Another interesting fort is the old Dutch one at Point de Galle in the South of Ceylon. I think it must be larger than Fort William, as the important part of the town is contained within the Fort. It is built on a slight promontory. Over the arch leading to the jetty is the date 1668 cut on a stone.

Very interesting is the old Dutch church, on the floor of which are many tombstones, the oldest date being 1659. On the wall is a large wooden memorial to "Commandeur le Gale; died August 12, 1713." There are (or rather were when I was there) many relics, including a very rusty pair of old spurs, which I presume the gallant "commandeur" wore.

The fort represents tremendous labour, but is now neglected, and is here and there being grown over with trees and bushes.

Wednesday, Jan. 29.—This afternoon we passed several sea-snakes quite close to the ship.

They were about three feet long, and of a dirty yellowish colour, with blackish cross stripes. There is no question about them not being snakes, as they wriggle along in characteristic snake fashion, *on the top* of the water, and not through it, as they would do if they were eels. There are different species of sea-snakes, and all are deadly poisonous; but they are said to be so timorous that they may be regarded as practically harmless.

I believe they are fairly common in the Bay of Bengal; but this is only the second time I have seen them. The last time was many years ago when I did a voyage from Calcutta to Bombay in the (then new) Royal Indian Marine ship "Hardinge." I was in medical charge of the 93rd Argyll and Sutherland Highlanders, and we were on our way to Poona, via the sea and Bombay. The old "Hardinge" is still afloat, but the Royal Indian Marine service is about to be scrapped. It was never quite a popular service, but in order to try to increase its popularity, it was euphemistically styled "the curry-and-rice Navy." But apparently the appellation had not the desired effect.

Thursday, Jan. 31.—Picked up the Hughli pilot at 11 a.m. yesterday,

and disembarked the passengers to-day at 1 p.m. at the Eden Garden Ghat; after which we shifted to No. 2 jetty (near Howrah Bridge).

On the outward voyage we are, of course, travelling away from home, this means we (the ship's crew) get an accumulation of three weeks' mails when we arrive at Calcutta. These naturally are eagerly looked forward to; but this time it was a pretty sad mail for me, as it contained no less than four letters all assuring me that "The Traveller" was not written by Byron, as stated in my recent contribution to the Journal ("Yarns of a Ship's Surgeon"). Here is what one fair lady writes: "Considering the amount of money your father spent on your education I am surprised you do not know who wrote 'The Traveller.' Your ignorance is colossal! Goldsmith, of course, wrote it."

So that's that! I think I'd better give up quoting from the poets.

The Hughli river, which, of course, is a branch of the Ganges, is very tricky from a navigation point of view, owing to the strong current and numerous sandbanks, which are continually changing their positions. The result is the pilots have to serve a long apprenticeship before they are qualified to take a ship up or down. It is the most highly paid pilot service in the world.

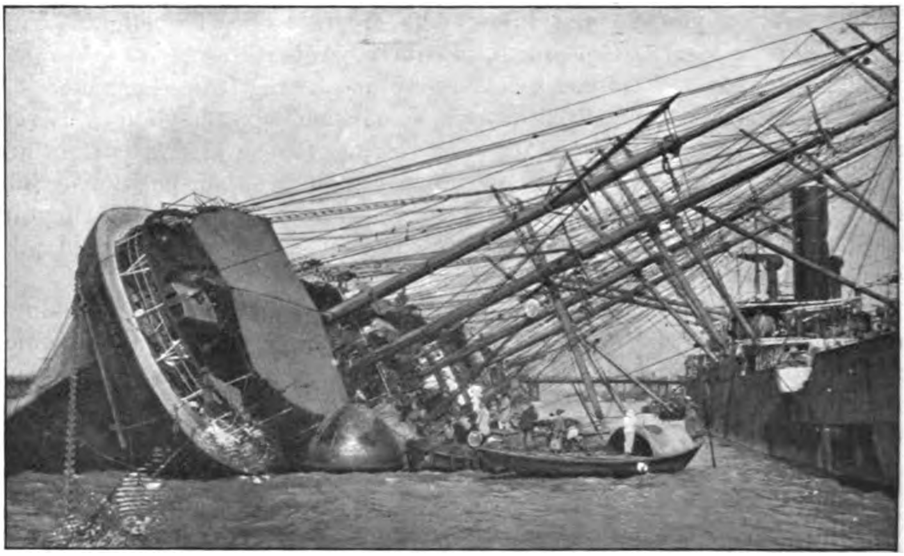
First glimpses of the Hughli are anything but impressive. Low down on the horizon on both sides can be seen some scrub and jungle, which those who know, or pretend they do, assure you is teeming with game, and is the happy hunting ground of the big game shooter. This place is called the Sunderabunds, and I believe contains a quantity of tiger and other big game. But, generally speaking, it is rather shunned by sportsmen owing to swamps, thickness of the jungle and other reasons.

But owing to the swiftly flowing stream, together with the speed of the ship, the monotony of the Sunderabunds does not last long, the banks close in and native craft begin to appear; at first scattered, but soon in ever-increasing numbers, and of every shape and size; some lazily splashing the water with their paddles, others with their threadbare sails taking every advantage of the breeze that doesn't blow, for there is scarcely ever a puff on the Hughli, save during the three months of the summer monsoon. But whether paddles or sails are used, neither count for much—it's the swift current that does the trick.

As the ship speeds along, the first thing pointed out to the newcomer is the site of the "Anglia" bank. Here a ghastly tragedy took place about thirty years ago. A large passenger steamer (the "Anglia") ran on the bank, and as the tide receded she suddenly toppled over into deep water and lay on one side, with the other just above water; from each of the port-holes on this side a head appeared, but they could only put out their heads, as the port-holes were too small for the unfortunate people to squeeze their bodies through. Word was sent to Calcutta and mechanics were despatched from there with all speed, and they worked feverishly cutting away the ship's plates, whilst the imprisoned ones could do

nothing but anxiously watch the work as it progressed. But the work was more than they could accomplish against time, and they had at length to desist owing to the rising tide, whilst the victims fell back from the port-holes one by one.

A few miles above the "Anglia" bank the river turns sharply to the west, and just at the bend, on the right-hand side as you go up, is Diamond Harbour, about fifty-two miles by river from Calcutta. A single railway line runs to the harbour, and it is an important signal station for the river pilots. There is also a post office and small native village.



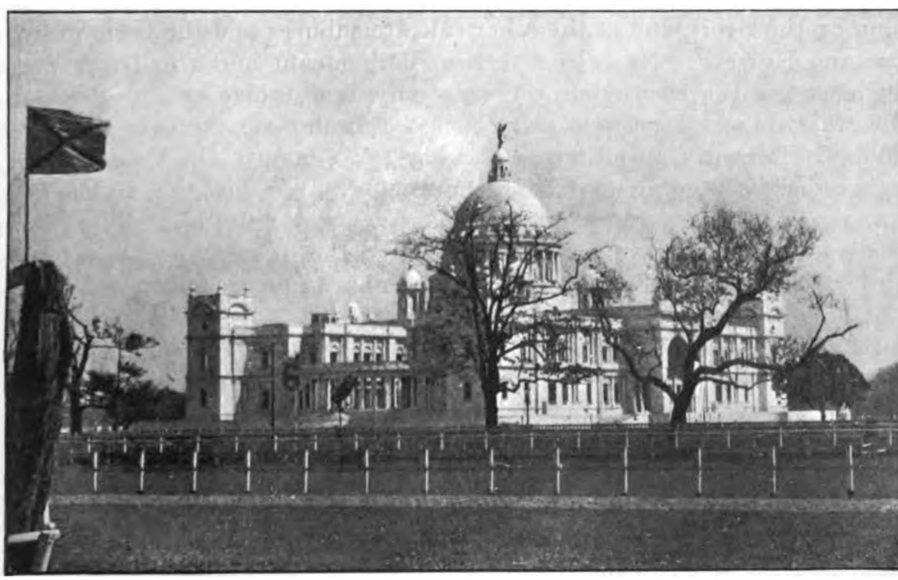
"Lenikenhafen," of Hamburg, capsized in the Hughli at Calcutta.

About half a mile to the south of Diamond Harbour is Fort Chingrikhal. As I look at it now with my glasses as we go by it seems a dreary waste; the gun emplacements appear to be broken up and overgrown with bush and scrub. So I think it must now be abandoned as a fort. But "in my time," that is a good many years ago, it was an important place, where an annual camp was held during the winter months, and "gunners" came from all over India for the practice and firing competitions. The river here is about three and a half miles wide, still the shells used to ricochet and go ashore; so that, during the firing of the big guns, the opposite bank for several miles inland was cleared of people, and for this interference with their freedom large sums were paid to the natives as compensation. Perhaps the policy of "retrenchment" had something to do with the abandonment of the camp.

From this up the river begins to get interesting. The nodding date and coconut palms, the vivid green "paddy" fields, on both sides of the bank, and the quaint native huts and villages scattered along are pleasing to the

eye. A few miles from Diamond Harbour the river again turns sharply to the north. An occasional European bungalow now appears, but it is not until Budge Budge is reached that the real "business side" of the river is thrust on one. For some miles along the right bank here are the tanks and refining machinery of various petroleum companies, each having palatial and well-kept bungalows with recreation grounds for the European staffs.

On the opposite side of the river, also extending for miles along the bank, are jute mills. They too, with their European quarters, are kept spick and span, and suggest much prosperity and wealth. Then further up Garden Reach on the right bank is seen. It is a suburb of Calcutta, and here are the well-known Kidderpore Docks, with their spacious



The Victoria Memorial. View taken from the Race Course, Calcutta.

accommodation and equipment for loading ships with jute, tea, hides, linseed, manganese ore and coal—these constitute 99 per cent. of the shipping exports from Calcutta. (Imports are unloaded at the wharfs along the river side.)

Opposite Garden Reach is the Botanical Garden with its world-famed banyan tree, the one tree covering an area of three acres.

Calcutta itself is now seen in the background. As one approaches three things catch the eye; the first is the fine dome of the post office buildings; the second is the white marble dome of the Victoria Memorial, only recently completed, having been started as far back as 1904. This is a building of really superb design and structure, situated all by itself on the Maidan. The Maidan is known as the Hyde Park of Calcutta, also as the "lungs" of Calcutta; on it near the river is Fort William.

The third thing which catches the eye as one approaches is the War Memorial to the lascars or native seamen who fell in the war. It is situated on the Maidan near Outram's Ghat, and takes the form of a high graceful tower of Eastern design. It is surmounted by a golden cupola, which, glittering in the sun, makes it very conspicuous. It has only just been completed.

Calcutta is not the ancient home of the Great Moguls. It is of comparatively modern date.

The East India Company established their factories at Hughli, a prosperous town on the river of that name, but for some reason, in 1686, they shifted about forty miles down the river to a place with only a few mud huts, but famous for its shrine to the goddess Kali. From this sprang the mighty Calcutta of to-day. Calcutta is on the right bank (that is when going up the river), and at the other side are suburbs and the large railway terminus Howrah. Numerous ferries, both steam and row-boats, carry people across the river; but there is only one bridge spanning it—the Howrah Bridge. Incessant and congested traffic goes on over this night and day. Recently an animated controversy amongst the Calcutta City Fathers has been going on over the question of a new bridge. In the local newspapers some strenuously advocated a cantilever bridge, whilst others equally strenuously favoured a repetition of the present one—that is a pontoon bridge. I believe the pontoon has been finally approved, but it is to be broader than the present one.

Saturday, February 9, 1924.—Yesterday morning about 5 a.m. there was a heavy "nor-wester," with much thunder and lightning, and a deluge of rain and wind. In the midst of it the ship gave a heavy bump and shook all over. I thought we were in collision, and jumped up and went on deck, but it was the weight of the wind which had carried us against the jetty with considerable force, and no damage was done. The storm lasted only about half an hour, but it brought down the temperature with a bang, and it was very nippy when the storm was over.

Having completed the discharge of steel and cement at No. 2 jetty, we left for Kidderpore Docks shortly after the storm. We left the jetty with our bow facing up the river, and were to drop down backwards to the docks, so, by order of the pilot, an anchor was let go with fifteen fathoms of chain out, and the engines put "full astern." And in this way we dropped down, the anchor checking her and keeping her head to the stream. Suddenly the anchor gripped in something, and the chain "took charge" and began to run out with a great rattle.

There was consternation on the forecastle as nothing could be done there to check the chain, and it is not unknown in accidents of this sort to have the deck torn up and go overboard, winch and all. Shouts for "full ahead" were raised, and fortunately this was accomplished before the full length of chain had run out, and so all was well. But it might easily have been otherwise, and it was quite a "touch and go" affair while it lasted.

(*To be continued.*)

Current Literature.—Abstracts.

Chemical Warfare: Gas Offence, Gas Defence, and Smoke Production. By R. Hanslian and F. Bergendorff, Berlin, 1924.—We publish short extracts from this book as we think they indicate clearly the wide range of chemical warfare.

PREFACE.

The authors state that the purpose of the book is to give an unbiassed review of chemical warfare based on published facts.

They state that a certain amount of information on chemical warfare has been published in American and English journals. Although Germany was not the originator of chemical warfare, she maintained her lead in it throughout the war. German methods are therefore largely referred to. Where the claims of Germany and the Allies differ, both sides have been quoted.

INTRODUCTION.

A very general chapter on toxic gases, their definition (i.e., gases, liquids or solids) and their method of use, chief methods of anti-gas protection, importance of gas discipline and the psychological effect of gas on troops.

I.—GAS OFFENCE.

1. DEVELOPMENT OF GAS ATTACKS.

A brief historical summary of early uses of gas and smoke from ancient times to 1871 is given.

Special reference is made to Article 23e of the Hague Convention wherein the use of weapons, shell or substances causing unnecessary suffering is forbidden. The words *unnecessarg suffering* are emphasized; the argument being that firstly, if there was one weapon introduced during the war which could not be called useless that weapon was gas. Secondly, statistics on the German and French sides show that the fatal casualties due to gas were only about three per cent. Moreover, other casualties soon made a complete recovery. By other weapons fatal casualties were twenty-five per cent. Therefore Article 23e of the Hague Convention does not apply to gas.

The only section of the Hague Convention which does apply is the clause forbidding the use of gas weapons from the air—particularly in reference to the defenceless civilian population—and the use of projectiles whose sole purpose is spreading of asphyxiating or toxic gases. It was realized that carbon monoxide, prussic acid and oxides of nitrogen must always be produced, and hence the proposed clause, "The explosive effect of such projectiles must exceed their toxic action." The insertion of this clause was not agreed to by England and America. England finally, in

1907, agreed to subscribe to it, but America did not. Germany adhered to this strictly till May, 1916, when German Green Cross was introduced, as the French had already departed from the undertaking by using phosgene shell in February, 1916. This shell had little shattering effect, but considerable toxic action. The German prior use of lachrymators in shell, which had a considerable explosive action, and the use of gas clouds, which was but a revival of the ancient smoking out methods, and had not even been referred to in the agreement, was but a formal transgression of the law of nations.

Chemical Warfare Preparations by the Higher Commands of the various countries.—In so far as Germany was concerned, no preparations had been made prior to the war for the use of chemical substances. Germany had relied entirely on the use of ordinary weapons.

The French had introduced prior to the war a twenty-six millimetre rifle-grenade charged with ethyl bromo-acetate, and this had been used prior to the war against the apaches at Choisy-le-Roi. The French pioneers carried these with them in the war, and instructions for their use were issued by the French War Ministry on February 21, 1915. They also carried a gas hand-grenade charged with ethyl bromo-acetate and chloro-acetone. This was used for the first time in March, 1915.

German Irritant Shell.—The German Army fired in the year 1914, on October 27, 3,000 shells charged with dianisidine. It was only, however, in the beginning of 1915 that a fifteen cubic metre German gas shell, charged with a mixture of xylyl and xylylene-bromide, was used. This was replaced later by bromo-acetone and bromo-methylethylketone.

Military Necessity for Gas.—The stalemate of trench warfare turned the thoughts of the General Staff to the use of chemical warfare materials, as it was found that explosive shell were of little value against the opponent's trenches.

Introduction of the Gas Cloud Method by the Germans.—The existence of large quantities of chlorine in Germany in the liquid state suggested the possibilities of its use. Contravention of International Law did not arise, as the toxicity of chlorine was not so great as that of ethyl bromo-acetate and chloro-acetone, which had already been used by the French.

A brief description is given of the first German gas attack on April 22, 1915.

A short historical account is then given of the developments of gas warfare.

The part the Americans played in supplying gas shell and men and the preparation of gas warfare chemicals in the States up to the end of the war is briefly discussed.

Brief reference is also made to the casualties by gas warfare as given in the reports by the Americans, English, French and Germans, which show that chemical warfare means were the most effective in causing casualties in the World War.

(2) Gas Warfare Chemicals.

The nature of the so-called gases is discussed and the methods of classification adopted by the Germans and the Allies are given.

Typical examples of each class are mentioned, with general particulars of their toxic effect and the mode of use (i.e., from shell, projectors or cylinders).

For the purposes of the book, the following classification is adopted:—

(*a*) Lachrymators.
(*b*) Lung irritants.
(*c*) Prussic acid type.
(*d*) Mustard gas.
(*e*) Arsenic gases.
(*f*) Gases from high explosives.

Under each section, the gases used during the war are enumerated; their physical and physiological properties, their tactical importance and mode of use being given:—

(*a*) *Lachrymators.*
Xylyl bromide and xylylene bromide.
Bromo-acetone and bromo-methylethylketone.
Bromo-benzylcyanide.
Dimethyl-sulphate.

(*b*) *Lung Irritants.*
Chlorine.
Chloro-methylchloroformate.
Phosgene.
Trichloromethylchloroformate (diphosgene).
Chloro-picrin.

(*c*) *Prussic Acid.*
Hydrocyanic acid.

(*d*) *Mustard Gas.*
Dichlorodiethylsulphide.

German Yellow Cross shell, with small bursting charge.
German Yellow Cross H.E. shell.

This latter type of shell combined the properties of a gas and H.E. shell and was first used in March, 1918. The gas and H.E. were contained in separate compartments. The upper chamber contained the fuse H.E. The intermediate part was filled with an iron parabolic diaphragm. Such shell were known as Z.B. and were also used later with Green Cross filling. In consequence of the heavy explosive charge a complete conversion of the mustard gas into vapour took place.

(*e*) *Arsenic Compounds.*
Diphenylchloroarsine.
Phenyldichloroarsine.
Diphenylcyanoarsine.
Ethyldichloroarsine.

Ethyldibromoarsine.
Methyldichloroarsine.
Chlorovinyldichloroarsine.

(*f*) *Gas from H.E. shell.*

Carbon monoxide.—Advantages of use of carbon monoxide: failure to detect its presence in the atmosphere, and penetration of respirator.

Disadvantages: its lightness, difficulty of loading compressed into projectiles.

It is stated that the technical difficulties of its use might be overcome in the future, and attention is drawn to the adoption by the American Navy of the Burrell respirator containing hopcalite, which gives protection against carbon monoxide.

Tables are then given of data for the different gas weapons used by the various countries.

Particulars are likewise given of the various weapons used by the English, French, Russians and Italians, but the data are not so complete as in the case of German projectiles.

Statistics of the chemicals filled into shell, number of projectiles filled and total weight of gas chemicals made by America are also given.

3. TECHNIQUE OF GAS ATTACK.

(*A*) *Cloud Method.*

Particulars are given of the arrangements made for a gas-cloud attack, such as nature and number of cylinders required for a given front, personnel for operating and installation, weather and terrain considerations. The organization of the attack and the gases which are suitable are also discussed. Deductions are drawn from war experience as to the military value of such attacks.

Details are then given of a number of German gas-cloud attacks during 1915-1917 on both fronts, data as to wind direction and velocity, time of duration of cloud, and number of casualties caused to the Allies, any other relevant data where available being included.

Brief summaries are also given of the French and English gas-cloud attacks during the same period. More detailed data are given of several Russian gas-cloud attacks.

(*B*) *Gas Shell.*

This section opens with a discussion of the development of the use of gas shell for bombardments, and the factors, such as weather and terrain, which have to be considered in relation to the tactical importance of this method.

(*A*) *German Tactics.*

German tactics are then discussed in detail in reference to the early type of gas shell and, subsequently, the development of definite types of bombardment for offensive or defensive purposes, as fresh chemical shell were introduced.

Types of Gas Bombardment :—

(*A*) *Gas Surprise Attack or Small Gas Bombardment.*—Number and nature of shell are laid down and meteorological conditions specified. An example of an attack of this nature is given by reference to German gas attacks on the Italian front on November 23 and 24, 1917.

(*B*) *Gas Barrage.*—(*a*) (*b*) *Medium and Heavy Gas Bombardments and* (*c*) *Gas Curtains.* The nature of these types of bombardment is discussed, and the amount of ammunition required to gas given areas considered.

Data are given for attacks on the Eastern and Western fronts during 1916-1917.

(*C*) *H.E. Gas Shell.*—The use of typical H.E. gas shell developed by the Germans is discussed.

(*D*) *Drenching of an area by Gas Bombardment.*—The special use of Yellow Cross Shell for contaminating a given area is referred to, and detailed particulars are given from attacks in the Western Front in 1917.

Protection of German Troops against German Gas Bombardment.—Distances from front line trenches for bombardment with different shell are laid down.

Development of German Gas Artillery Tactics during 1918.—The special development of tactics during 1918 are discussed, and detailed accounts are given of the gas bombardments during the March and April 1918 offensive.

Casualties of the English Army by German Gas Bombardments.—Casualty tables, as given in " Medical History of the War," are reproduced.

Tactical Considerations.—The task of the artillery in gas bombardment is finally summarized, and it is laid down that the fundamental condition for the success of a gas bombardment depends on the rapidity with which artillery tactics can be changed to meet varying battle conditions, i.e., to be able to vary the nature of the gas shell to battle and weather conditions.

(*B*) *Tactics of the Allies.*

The authors emphasize the fact that the tactics of the Allies were based on a study of German practice. Reference is made to the Allies classification into three types :—

(1) Irritant or neutralizing shell.
(2) Lethal shell.
(3) Semipersistent and persistent shell, and the various objects for which such shell can be used.

Each class of shell is then discussed in relation to England, France and America, in so far as instructions were laid down for rate of fire and calibre for a given area.

A special detailed account is given of the English gas bombardment on the Western Front, June 16, 1917.

The American proposal for use of gas shell fitted with irritant and persistent gases is discussed.

(*C*) *Gas Bombardments by other Weapons.*

(*A*) *Hand Grenades.*

Brief reference is made to the limited use of such grenades with a chemical filling by the French, Germans and English.

(*B*) *Trench Mortars or Projectors.*

A general account is given of the development of the various types of German mortars for use in gas bombardments and particulars as to nature and weight of fillings, rate of fire, etc.

The several types and their use are then discussed in detail.

(*a*) *Light Gas Bombardments by Trench Mortars.*—Type of mortar, weight of filling, range, number of mortars required for a bombardment, number of projectors to be fired, rate of fire. Data of attack on Eastern Front, July 28, 1917, are given.

(*b*) *Medium Gas Bombardment by Trench Mortars.*—Some data are given as to numbers of mortars and projectiles required to put up a bombardment over a given area.

(*c*) *Heavy Gas Bombardment by Trench Mortars.*—Data are given of a heavy attack on Eastern Front on October 27, 1917.

(*d*) *Concentrated Gas Bombardment by Trench Mortars.*—Data are given of the requirements of this type of bombardment.

Stokes Mortar.—An account is given of the use of the Stokes mortar, charged with gas, by the Allies.

(3) *Method of Projecting Gas by Trench Mortars.*

The practical value of this method of projecting gas is discussed, with particular reference to the development of the Livens Projector and its use at Lens March 31, 1918. The development of the eighteen cubic millimetre German gas mortar is then described and particulars of the design and use are given. Detailed accounts of a German trench-mortar attack in the 12th Isonzo battle on the Italian Front on October 24, 1917, and of an American attack against the Germans on August 18, 1918, are also given.

II.—Gas Defence.

The importance of gas defence and the lack of any preparations by all combatants before the War is discussed.

I.—Anti-Gas Measures for Personal Protection of Personnel.

The two main types of respirator are briefly discussed, i.e., the filtering or absorption apparatus and the self-contained oxygen breathing sets, and the advantages and disadvantages of both types compared.

(*A*) *Gas Masks or Respirators.*

The first type of protection introduced directly after the first gas attack is briefly referred to, and the essential minimum requirements of any respirator are laid down.

(*a*) *Germany.*—A detailed account of the evolution and development of the German respirator is then given from 1915-1918. Reference, among other things, is made to masks for men of irregular features and for wounded men, to the disinfection of masks and the protection necessary for substances of the Blue Cross type.

Special reference is made to the attachment of a cotton-wool pad to the outside of the drum to protect against particulate matter of the Blue Cross type. Mention is also made to a special respirator produced for the German Navy and to the provision of "breathing pads" for civilians behind the lines.

A description is also given of the post-war development of the German respirator for industrial purposes, known as the "Optolix" respirator.

(*b*) *Allies.*—Detailed descriptions are also given of the development and evolution of the various types of gas masks by the English, French, Russians and Americans. The post-war developments of the American respirator are also referred to in detail, especial mention of the adoption by the American Navy of the Burrell Hopcalite type of respirator being made

Attention is drawn to the general importance of gas discipline to enable gas masks to be worn under fighting conditions.

(*B*) *Light Self-contained Oxygen-breathing Sets.*

A detailed description is given of the various self-contained oxygen-breathing sets used by the Germans and English.

Special reference is made to the post-war development of such sets, and descriptions are given of the new Drager and Hanseatic (Audos) types. The 1914 model of the Audos apparatus weighs 7·5 kilogrammes.

(*C*) *Protective Clothing.*

Reference is made to the essentials of protective clothing, and the development of such clothing by the Americans and English is briefly alluded to.

The use of protective ointments by the Allies is also mentioned.

(*D*) *Gas Protection of Animals.*

The German view is that horse masks are of value. An account is given of the masks used during the war by the French, English, Americans and Germans.

The special horse-protective shoes, dog-masks, and German pigeon-boxes are also described.

2.—Collective Protection.

The question of collective protection is considered in relation to the various anti-gas measures adopted by all sides :—

(a) Gas-tight dug-outs and dug-out curtains.
(b) French earth filters.
(c) Russian fire and smoke method for preventing gas getting into trenches.
(d) Degassing of trenches by fans or pumps.
(e) Detectors for chlorine.
(f) Special indications of a gas attack by the enemy to be looked for.
(g) Gas alarms.

A detailed description is given of the Meteorological Service Organization and its functions.

Particulars are also given as to the care to be taken of weapons and apparatus, and the treatment of water and food exposed to gas.

III.— Smoke Production.

The uses of ordinary and toxic smokes are discussed generally and their importance in warfare :—

(A) *Ordinary Smoke Production.*

The differeut smoke-producing materials used are discussed in detail, and the chief weapons in which they were used are described.

The putting down of smoke screens by the Artillery is discussed in relation to meteorological conditions, terrain and calibre of shell required, as laid down in English, French and German manuals.

The tactical uses of smoke in attack and defence are enumerated and advantages and disadvantages reviewed.

(B) *Toxic Smoke Production.*

The production of toxic smokes by use of NC (i.e., chloropicrin and stannic chloride) and diphenylchloroarsine is described.

Fries' and West's description of the toxic smoke candle (BM) and dispersoid toxic smoke candle is quoted.

The putting down of smoke screens by aeroplanes and developments in the use of ordinary and toxic smoke bombs from aeroplanes in future warfare are referred to.

IV.—Post-War Development of Chemical Warfare and its Importance in the Future.

Reference is made to the campaign against Chemical Warfare after the Armistice. Quotations are made from speeches or writings of Professor Smithels and the Prime Minister (Mr. Lloyd George). The Disarmament Conference at Washington and the prohibition of the use of gas are mentioned. Quotations by General Fries and others in American journals at the time are given. The opinions of experts in various European countries, as

well as in America, in advocating the study of chemical warfare methods are noted.

The possibilities of the dropping of gas bombs from aeroplanes, or the sprinkling of gas from the air are pointed out and supported by reference to other writers.

The developments in 1918 of the gas-cloud attacks, using gas tanks on railway wagons, and light portable gas cylinders are referred to. The use in future of mustard gas hand-grenades, and toxic smoke-candles must be expected. The Powers are daily making progress in constructing mobile heavy calibre guns or mines filled with gas. The development of the technique in using the different gases for specific purposes is alluded to.

The question of protection is also discussed, especially in relation to the development of a respirator for protection against carbon monoxide. The possibility is advanced of a soldier being equipped in future with a respirator container and self-contained oxygen breathing set, so that he can switch over from one to the other as required, and with suitable protective clothing which he can quickly don ; by such means he will be in a position to meet an unknown gas.

How far such requirements can be carried out remains to be seen.

Quotations are given from Liddell-Hart's paper in the *R. E. Journal*, March, 1924, showing that from the English side such equipment will render the infantryman incapable of fighting. The use of gas-tight tanks to traverse gas-soaked areas is advocated.

Reference is made also to the protection of the sailor in relation to the provision of Hopcalite respirators, or self-contained oxygen breathing sets.

Conclusion.

In conclusion, it is stated that fundamental principles of war are not altered by the introduction of chemical weapons. The offensive spirit is still the key to success in warfare. The importance of the chemical direction of warfare is only gradually being realized. Chemical warfare has come to stay, a world domination will only come to the people who are most scientifically developed.

Appendices.

Illustrations are given of the use of gas cylinders and projectors and smoke candles, respirators and self-contained breathing sets, used by most of the countries participating in the war, horse masks, dog masks and horse protective shoes.

Three maps, taken from the Medical History of the War, are reproduced.

A table is given of the most important gases used during the war, with their code names, physiological classification, physical properties, unbearable concentrations, and methods of using. Date of first use.

A bibliography containing 84 references to journals, papers and books published on Chemical Warfare, concludes the book.

Reviews.

POST-GRADUATE LECTURES, Volume II, CANCER. Edited by Herbert J., Paterson, with a Preface by Sir John Bland-Sutton, LL.D., F.R.C.S. London: John Bale, Sons and Danielsson, Ltd. 1925. Pp. xvii + 186. Price 12s. 6d.

This volume consists of a series of lectures upon the "Pathology and Treatment of Cancer."

A Preface by Sir John Bland-Sutton, F.R.C.S., gives the reader an admirable general view of the problem of cancer treatment as it stands to-day.

Sir John Bland-Sutton emphasizes the great importance of using the latest and best instrumental aids for the early diagnosis of this disease. He points out also that the instruments required for the illumination and inspection of the internal cavities and orifices of the body call for prolonged training and practice before proficiency is obtained in their use.

Sir John Bland-Sutton compares the struggle of surgery with cancer to a battle, in which surgeons, pathologists, physicists, biochemists, etc., act together in a strong combination to defeat the cancer foe.

Sir Thomas Horder, Bt., M.D., contributes an article on the "Medical Aspects of Cancer" and calls attention to the responsibility which rests upon the general practitioner for the early recognition of this disease.

In the opinion of Sir Thomas Horder, however, there is a tendency amongst some medical men to consider as pre-cancerous in nature cases of chronic dyspepsia, both with and without associated ulceration.

This view, he states, is not supported by either clinical experience or morbid anatomy and causes unnecessary anxiety and alarm in numerous sufferers from chronic gastric disorders.

With regard to the treatment of cancer Sir Thomas Horder holds that in the first instance this must be surgical, whether radical or palliative in nature.

For the inoperable conditions he considers that the results obtained by treatment with selenium, lead and copper have been disappointing, but that undoubted improvement does often occur after radio-active treatment. The benefit experienced by the patient after radio-active treatment is often only temporary in character, but the fact that it occurs makes the outlook for the treatment of cancer much more hopeful now than it has been in the past.

Dr. Archibald Leitch gives a lecture on "The General Pathology of Cancer." The various theories as to the cause of cancer are not dealt with, but Dr. Leitch pays special attention to the pre-cancerous condition of affected tissues. He considers that the results of surgical treatment

would be greatly improved if surgeons were to pay closer attention to conditions, such as leukoplakia, etc., which are known to precede the appearance of cancer of the tongue.

While unfortunately there are no known histological appearances which can be definitely stated by the pathologist to be pre-cancerous in nature, the surgeon is, in Dr. Leitch's opinion, justified in advising removal of doubtful tissues. To wait in these cases until the diagnosis is certain often means that the operation is performed too late to effect a cure of the disease.

The volume contains separate articles upon the surgical treatment of cancer in the following regions: Larynx, œsophagus, breast, stomach, uterus, intestines, kidney, bladder and rectum. Each article is contributed by a surgeon who has made a special study of the treatment of cancer in the particular region he deals with in this book.

The volume provides an excellent and ready means whereby the accumulated knowledge and experience of these expert specialist surgeons may become known to the general surgeon and practitioner.

There are also numerous diagrams and illustrations which add greatly to the value and clearness of the descriptions; and the book will be read with great interest by all medical men desirous of obtaining the latest authoritative information on the treatment of cancer. C. C.

THE NEMATODE PARASITES OF VERTEBRATES. By Warrington Yorke, M.D., and P. A. Maplestone, D.S.O., M.D. London: J. and A. Churchill, 7, Great Marlborough Street. 1926. Pp. xi + 536. With 307 illustrations. Price 36s. net.

The authors are to be congratulated on this excellent book of reference, the compilation of which must have entailed an enormous amount of patient and painstaking labour. The need for such a book is best understood when it is realized that it is over fifty years since a previous attempt to cover the same ground was made. In this interval the importance of helminthology has come to be more and more recognized, both by practitioners of medicine and by the veterinarian, in consequence of which the literature of the period teems with descriptions of round worms, new and old. To the Herculean task of systematizing this mass of data the authors, making use of the extensive collection of nematodes at the Museum of the Liverpool School of Tropical Medicine, have applied themselves, and the volume under review is the result.

The NEMATHELMINTHES are regarded as constituting a Phylum, which is divided into two classes, ACANTHOCEPHALA and NEMATODA. The latter class includes two orders, GORDIACEA and EUNEMATODA; and it is the latter which are described in this book. Eight superfamilies are distinguished, and these are further divided into families, subfamilies and genera. Keys are given which enable any round worm to be placed in its genus. Each genus is succinctly described, type species being used as far as

possible for this purpose. Under each genus there is included a list of all recognizable known species and their hosts. Life histories are not given.

As is inevitable in a work of this kind, where systematization is being carried out on a large scale, a few "kent faces" appear with unfamiliar names. Thus *Filaria bancrofti* is named *Wuchereria bancrofti*, whilst *Acanthocheilonema perstans* becomes *Dipetalonema perstans*. A more disconcerting feature is the omission, even as a synonym, of *Filaria ozzardi* (synonym *Filaria demarquayi*). Although the parasite cannot be regarded as an important one, its absence from a work of this completeness is curious. No doubt it is among those which the authors refer to in the preface as one "of the earlier species knowledge of which is not sufficient to permit of their classification," yet one is surprised that as one of the few "filarial" parasites of man it has not been vouchsafed at least a passing reference.

The illustrations are chiefly in the form of line drawings of type species, and are largely original. Illustrating as they do the main points of each genus, they serve as valuable amplifications of the text. Nevertheless one must confess to a certain dissppointment regarding the delineations of some of the more common human parasites. Thus the drawings of the dorsal rays of *A. duodenale* and *N. americanus* are not very illuminating, that of the former requiring to be magnified in order that the terminal branching may be distinguished. The ovum of *A. duodenale* has its contour depicted by three lines which convey the impression of a massive shell quite unlike the real state of affairs.

Two indices, one of the generic names and synonyms, and the other of specific names, render the information contained in the book very accessible. A list of approximately 700 references gives some idea of the immensity of the task which has been undertaken, and so successfully accomplished.

To those interested in helminthology and having good previous knowledge of the groundwork of the subject this book will be of the greatest value. To the novice, however, it can hardly be recommended. The absence of a preliminary survey of the anatomy of round worms, emphasizing the points upon which generic differences are established, coupled with the absence of a list of definitions of helminthological terms, must needs render the understanding of the descriptions a matter of great difficulty to anyone approaching the study of the nematodes for the first time.

J. S. K. B.

Modern Methods of Feeding in Infancy and Childhood. By Donald Paterson, B.A., M.D.Edin., M.R.C.P.Lond., and J. Forest Smith, M.R.C.P.Lond. London: Constable and Co., Ltd. Pp. 106.

It is difficult to see where there is any new ground to be broken in so well ploughed a field as this. Yet it must be said that the authors of this

monograph have in a measure achieved the seeming impossible. They advocate a system of infant feeding, whether by breast or bottle, in which the amount of daily intake is correlated strictly with the weight of the infant, in place of the conventional increase for age. It is, one might say, in their opinion, a question of "weight for weight" rather than "weight for age." Their arguments and conclusions are sound, and bring into clear relief the true relationship between breast milk on the one hand and cow's milk and the proprietary foods based upon it on the other.

One cannot however but feel that a system which involves frequent and perhaps daily weighing must be limited rather to institutions than practicable in general practice. But to say this is not to write the book down as doctrinairian. Between its covers will be found crystallized into italicized aphorisms commonsense principles of great practical utility.

The book is strangely silent about the value of whey, whether alone or as a diluent, and of albumin water. Very complete tables are included classifying and giving the analysis of all the common proprietary foods. Whilst urging with all emphasis the supreme value of breast milk the author's hold in very judicial balance the claims of dairy milk, and its evaporated or dried variations. This monograph, in short, is one which the general practitioner and the medical officer in charge of a Families' Hospital will find a valuable addition to his library. P. C. T. D.

A Textbook of the Practice of Medicine. By various authors. Edited by Frederic W. Price, M.D., F.R.S., and dedicated to the memory of the Right Hon. Sir Clifford Allbutt, P.C., K.C.B., etc. Oxford University Press. Price 35s.

This book may justly be described as *the* post-war textbook of medicine. So complex and diverse is the study of medicine nowadays that the one-man textbook is no longer possible or desirable. The book in question, a work of moderate compass and in one volume, is comprised of separate articles on different subjects, and each subject is dealt with by a recognized authority.

With the view of obtaining so far as possible uniformity of style the principle is adopted of allotting a whole section to one author.

That the book has already been highly appreciated is shown by the fact that the first edition (1922) was followed at yearly intervals by four fresh impressions, and in view of the necessity of including new work the second edition now appears.

This edition has been thoroughly revised and brought up to date and articles on such subjects as Tularæmia, Botulism and Tuberculosis of the Kidney, etc., are added.

Other new matter includes notices of the Schick test in diphtheria and the method of producing active immunity, the Dick test in scarlet fever, mental sequelæ following encephalitis lethargica, and so on. Some other articles which appeared in the first edition have been entirely rewritten.

The authors of the articles, who are all recognized authorities in their special subjects, are selected not from one medical school but from all the large hospital schools in London. It is of course not possible to review the whole book closely, but one or two points are noted.

In the chapter on Bacillary Dysentery Strong's bacillus is alluded to as a cause of dysentery. Strong himself in conversation with the reviewer during the war stated that he was very doubtful if the bacillus he had isolated from a case of dysentery was the true cause of that disease and he was inclined to think that it was one of the many types of bacilli which can be isolated from a post-dysenteric stool.

It would appear to be better to adhere to the modern classification of dysentery bacilli as non-mannite fractors (Shiga) and mannite fractors (Flexner), the latter being again divided up by their serological affinities.

Another small point is that being at the moment acutely interested in lumbago and fibrositis we turned to the section on that disability and were then referred by cross reference to "infective arthritis" (see pp. 1152-1161), but on referring to these pages we find that they deal with nephritis, not arthritis, possibly a suggestion for treatment by Doan's backache pills.

It would be curious if this single reference verified should be the only erroneous one in the book. But these are small points and the book can be thoroughly recommended to the practitioner and to the student, who if he masters it will find himself equipped at all points; the only drawback from his point of view being the cost, but in view of post-war printing costs this cannot be said to be exorbitant.

THE RESPIRATORY FUNCTION OF THE BLOOD. Part I. Lessons from High Altitudes. By Professor Joseph Barcroft. Cambridge University Press. 1925. Pp. 207. Price 12s. 6d.

This book teems with interest. Although it contains much of a highly specialized and technical nature, Professor Barcroft's style of writing is so clear and so attractive that the book can be recommended for perusal by all. Those who read it will find amusement, interest and profit. I venture to predict that no one will lay it down again without a sense of having had real enjoyment and of having acquired valuable information whether he be "specialist" or "general duty officer." It is difficult to make selections from so excellent a whole, but Chapters I, IX, XII and XIII are specially recommended for their general interest.

There is an excellent appendix by Major Hingston, I.M.S., Medical Officer to the Everest Expedition, 1924. H. S. B.

Reports and Analyses.

MEDICAL bacteriologists may be interested to know that Burroughs Wellcome and Co. are in a position to supply sodium salts of the following organic acids: *d*-tartaric, *l*-tartaric, *meso*-tartaric, citric, fumaric and mucic. These agents are now being employed in the differentiation of bacterial types in which "sugar reactions" are untrustworthy or fail altogether. Further particulars may be obtained on application to Snow Hill Buildings, London, E.C.1.

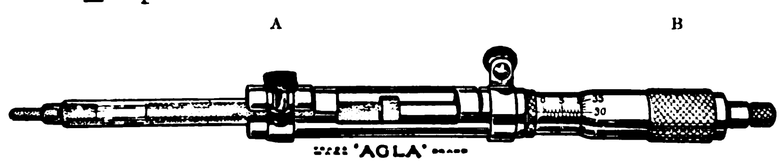
SODIUM SALTS OF TETRABROM-PHENOLPHTHALEIN AND TETRAIODO-PHENOLPHTHALEIN.

BURROUGHS WELLCOME AND CO. are in a position to supply sodium salts of tetrabrom-phenolphthalein and tetraiodo-phenolphthalein for use in cholecystography.

These salts may be obtained in gelatine capsules for oral administration or in glass containers if intended for intravenous injection. Medical men should state the strength required when ordering.

THE "AGLA" MICROMETER SYRINGE APPARATUS.

THE accurate instrument for the measurement of extremely minute quantities of liquids, described by Dr. J. W. Trevan in *The Biochemical Journal*, vol XIX, No. 6, p. 1111, is now obtainable from Burroughs Wellcome & Co. It is known as the "Alga" Micrometer Syringe Apparatus, and is suitable for the measurement of volumes from 0·5 c.c. (with an error of less than ± 0·1 per cent) to those as small as 0·001 c.c. (with an error of less than 5 per cent). In immunological work the instrument can measure volumes of the order of 0·01 c.c. with an error of less than ± 1 per cent.



In the illustration the instrument is shown assembled for use. The syringe is firmly clamped at (A) and should be so arranged that it is not quite empty when the micrometer is screwed down to the zero mark. Supplied with the apparatus is a syringe of such a size that a 0·5 mm. movement of the piston (one turn of the micrometer head B) will eject 0·01 c.c. The syringe is filled by unscrewing the micrometer head and drawing up fluid by moving the piston by hand. If the filled instrument is allowed to stand for any considerable length of time, evaporation will

cause the liquid to retreat slightly from the end of the needle so that, after standing, the first 0·01 c.c. should be rejected.

The "Agla" Micrometer Syringe Apparatus enables a fine degree of accuracy to be attained in various delicate laboratory processes, including the following :—

(1) Immunological titrations with very small quantities of serum.

(2) The calibration of pipettes of small volume. For this purpose an ordinary fine hypodermic needle should be used and the required volume injected into the pipette by inserting the needle just inside the end of the capillary.

(3) Micro-chemical titrations and micro-gas analyses, in which the instrument may be used as a burette.

Price in London, 55s. complete, net.

Further details may be obtained from Burroughs Wellcome & Co.

WELLCOME HISTORICAL MEDICAL MUSEUM REOPENED.

THE Wellcome Historical Medical Museum, 54A, Wigmore Street, W.1., was partially reopened on June 1. The work of reorganization is still proceeding, and when completed the arrangement and classification of the collections will be systematized, and the objects made more accessible for inspection and study. The museum is open to members of the medical profession, chemists, pharmacists, nurses and research workers generally from 9 a.m. to 6 p.m. on week days, except Saturdays, when the Museum is closed at 1 p.m.

Correspondence.

MENINGOCOCCUS SEPTICÆMIA.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—The article on meningococcus septicæmia by Colonel J. C. Kennedy in your issue of July, 1926, in which he suggests that this disease is synonymous with Lendon's nodal fever (erythema nodosum), calls for some comment. At the present time there is a growing belief that erythema nodosum is a specific fever, but that it may predispose, just as measles predisposes, to subsequent tubercular infection. Unfortunately many of the erythemata have been confused with erythema nodosum, and Lendon himself has gone so far as to say that erythema nodosum is one and the same disease as erythema multiforme. In addition to the commoner erythematous rashes, many allergic skin rashes resemble that of erythema nodosum; and similarly some chronic tubercular skin lesions, which, however, are speedily differentiated by their history. I have shown elsewhere[1]

[1] *British Medical Journal*, November 5, 1921.

that erythema nodosum is communicated from person to person; it occurs in epidemic outbreaks with a definite seasonal incidence. There is a constant age incidence, and a definite and orderly sequence of events during the illness, etc. The cases described by Colonel Kennedy seem to me entirely to lack any real resemblance to erythema nodosum in these and other particulars.

The rash in Cases 2, 3 and 4, was found on the body, a very unusual situation, and in Case 1 it seems to have lasted for months. In Case 2 it is described as pustular, a condition never seen in erythema nodosum. In all the cases there was an absence of the characteristic bruise-like appearance as the rash faded.

The leucocytosis in meningococcus septicæmia is apparently much higher than in erythema nodosum (average 11,000 per cubic millimetre) and it is essentially an increase of polymorphs, whilst in erythema nodosum the lymphocytes are principally increased. The arthritis and the temperature in erythema nodosum are not controlled by salicylates, as in Colonel Kennedy's cases, and cultures made from the blood have in my experience been uniformly unsuccessful, although other observers have succeeded in isolating a streptococcus. To get positive blood-cultures in three out of four cases is almost sufficient to negative a diagnosis of erythema nodosum, and the fact that two cases out of four ended fatally is quite unlike nodal fever, in which the mortality is very low, certainly less than one per cent.

A section of the papule from Case 1 failed to demonstrate anything more than an excess of leucocytes in the blood-vessels, whilst in the lesions of nodal fever, the characteristic lesion is a giant cell of the granuloma type.

The association of an erythematous rash with meningococcus septicæmia is a point of diagnostic importance to which attention has not been sufficiently drawn, but I cannot see the slightest ground for regarding erythema nodosum and meningococcus septicæmia as one and the same disease. There is only one disease which erythema nodosum is closely associated with, and that is tuberculosis, to which it undoubtedly predisposes.

I should like slightly to alter Colonel Kennedy's advice to medical officers, and say "given a case of erythema nodosum, suspect later tuberculosis, especially tubercular meningitis."

I am, etc.,
J. O. SYMES.

71, Pembroke Road,
Clifton.
August 10, 1926.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Any demand for *reprints, additional to the above*, or for excerpts must be forwarded at the time of submission of the article for publication.

Notices of Births, Marriages, and Deaths are inserted in the *Corps News*, free of charge to subscribers. All communications should be written upon one side of the paper only; they should by preference be typewritten; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS." War Office, Whitehall, S.W.1.

The Committee has sanctioned the publication of correspondence on matters of interest to the Corps, and of articles of a non-scientific character under a nom-de-plume. These communications must, however, be approved by the Editor before publication.

MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription is £1 (which includes postage), payable in advance. Single copies, 2s. per copy.

All subscribers to the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, whose annual subscription is paid direct to the Manager of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, will receive monthly a copy of the *Corps News*.

The *Corps News*, separate from the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, can be subscribed for at the rate of 4s. per annum, including postage, payable in advance.

Subscriptions for the *Corps News* separate from the Journal cannot be accepted from Officers on the Active List unless they are also subscribing to the Journal.

The *Corps News* is not on public sale, but obtainable only from the Manager, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS.

Cheques or Postal Orders should be made payable to the "Manager, Journal R.A.M.C." and crossed "Holt & Co."

All communications should be addressed to THE MANAGER, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," A.M.D.2, WAR OFFICE, WHITEHALL, S.W. 1.

All Applications for Advertisements to be made to—

G. STREET & CO., LTD., 8, SERLE STREET, LONDON, W.C. 2.

Remineralization

of the System, following infection or shock, is one of the fundamental axioms of therapeutics.

Compound Syrup of Hypophosphites "FELLOWS"

contains chemical foods in the form of mineral salts and dynamic synergists in an assimilable and palatable compound, and has established its reputation as the *Standard Tonic* for over half a century.

Samples and literature on request

Fellows Medical Manufacturing Co., Inc.
26 Christopher Street **New York City, U. S. A.**

VALENTINE'S MEAT - JUICE

For **Quieting** the **Irritable Stomach** and **Aiding** the **Tired Digestive Organs,** for **Refreshing** the **Fever Patient** and for **Restoring** and **Strengthening** when Other Food Fails, **Valentine's Meat-Juice** is used in **Hospitals** and prescribed by many leading Physicians and Surgeons.

For sale by European and American Chemists and Druggists.

VALENTINE'S MEAT-JUICE CO.,
Richmond, Virginia, U. S. A.

CB 94

No. 4. October, 1926. Vol. XLVII.

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

BREVET-COLONEL A. E. HAMERTON, C.M.G., D.S.O., R.A.M.C.

ISSUED MONTHLY

Printed and Published by
JOHN BALE, SONS & DANIELSSON, LTD.
83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

Price Two Shillings net.

VOL. XLVII. OCTOBER, 1926. No. 4.

Journal

of the

Royal Army Medical Corps.

Original Communications.

POST-WAR ACUTE ULCERATIVE GINGIVITIS.

By Captain S. H. WOODS.

The Army Dental Corps

INTRODUCTION.

DURING the Great War, in the winter of 1915, the attention of medical and dental officers was drawn to an acute ulcerative condition of the gums, frequently spreading to the cheeks and tonsils, which affected large numbers of officers and troops and caused their withdrawal from the front lines.

This gingivitis spread so rapidly and became so prevalent as to suggest that it was communicable and it soon became known as "trench mouth." In view of the wastage caused by the disease and the severity of the constitutional symptoms, the importance of early diagnosis and appropriate treatment was apparent.

Before 1914 such an epidemic type of gum disease was almost unknown, only a few instances being recorded as occurring in such institutions as prisons and asylums.

To-day, under settled peace conditions, this epidemic form of gingivitis is not seen. Its place is taken by a non-epidemic type, and as its effect on the general health of the Army is not now so apparent, it has ceased to attract the attention of medical officers. The significance of early diagnosis and treatment is no longer generally recognized to-day, and the main object of this paper is to stress their importance.

The ætiology and symptoms of this post-war variety of gingivitis will be described and a simple emergency treatment indicated, which medical officers could carry out in the event of there being no dental officer available.

Ætiology.

Acute ulcerative gingivitis is a mixed infection caused by the *Bacillus fusiformis* and the spirochæte of Vincent. These organisms are invariably associated and their relative dominance in the tissues decides the severity and extent of the disease.

The *B. fusiformis* measures from six to twelve microns in length and is pointed at the ends.

The *Spirochæta vincenti* is a slender organism with wide, shallow, open curves.

Although these organisms first appear in the infant mouth with the eruption of the temporary incisors—the stagnation of food particles round the teeth being favourable to their growth—the disease is never seen in any mouth where the gingivæ are normal. The explanation lies in the effectiveness of the barrier made by the many layers of squamous epithelium which cover the gums. As long as this epithelium is intact and the vitality of the gums not reduced, the organisms which teem upon its surface cannot gain access to the submucous tissues to cause inflammatory reaction.

The presence of the disease in any mouth indicates either (*a*) some pre-existing local injury to the gingivæ, or (*b*) some constitutional disturbance which has lowered the vitality of the gums.

Both these predisposing factors are present in many cases.

Predisposing Factors.

(*a*) *Local Injury.*

By far the commonest cause of injury to the gums is the *stagnation of food debris,* which undergoes fermentative and putrefactive changes and causes a local inflammatory reaction at the stagnation area.

Any spot on the gum margin where food particles are allowed to collect may be the site of infection, for the inflammatory reaction produces a breach of surface epithelium through which the causative organisms gain access. Such stagnation areas are found round all teeth which are crowned, round roots and round functionless, misplaced and overcrowded teeth ; at the ledges of restorations and margins of heavy tartar deposits ; in the deep pocket behind the lower wisdom tooth and under the overhanging margins of teeth which have tilted ; at the margins of partial dentures which are not kept clean ; round the upper and lower incisors in mouth-breathers and all teeth involved in pyorrhœa alveolaris.

(*b*) *Trauma.*

Direct injury to the gum covering an erupting wisdom tooth is frequently caused by the opposing teeth, and here a breach of epithelium is rapidly made. The site is rendered more vulnerable to infection by the inflammation and food stagnation always present. Similarly, in cases of marked overlap of the incisors, the gum behind the upper teeth is injured whenever the lower incisors impinge directly on the soft tissues.

Constitutional Disturbance.

This may be considered under three headings: (*a*) General; (*b*) Chemical; (*c*) Dietetic.

(*a*) *General.*

In any debilitated condition, the resistance of the gums is below par, and hospital patients who have been ill for some weeks frequently develop the disease. Especially is this the case during the course of diseases of the respiratory system, such as bronchitis, pleurisy, pneumonia, influenza, affections of the throat and chronic nasal catarrh.

Here a certain degree of mouth-breathing takes place, producing a local gingivitis which, added to the lowered resistance of the tissues, predisposes the gums to infection.

In the acute fevers there is a marked diminution in the secretion of saliva, a tendency to mouth-breathing, and stagnation of food from the "slop" diet. This combination of factors rapidly lowers the resistance of the gums to infection, and acute ulcerative gingivitis is a not uncommon complication.

In diabetes and nephritis, a marginal gingivitis is often present which, unless the mouth is kept very clean, may lead to the acute condition.

The extreme importance of scrupulous cleanliness of the teeth and gums in these various conditions is not sufficiently realized. Mouth washes as generally used are almost valueless, and until the teeth and gums are thoroughly cleansed of food debris *after every meal* by brushing with a correctly shaped toothbrush and soapy paste or liquid, there will be no reduction in the incidence of ulcerative gingivitis in hospital patients.

(*b*) *Chemical.*

The administration of the compounds of the metals such as mercury, arsenic, antimony and bismuth very frequently produces a stomatitis characterized by bleeding, spongy and tender gums with exudation of pus, loosening of teeth and increase in salivation. The mouth becomes foul, food stagnates due to lack of brushing because of the tenderness, and the typical acute ulcerative condition occurs in the great majority of cases.

It was thought at one time that the administration of arsenic would have a specific effect upon the gingivitis by killing the spirochætes and "606" was used to this effect. My experience tends to show that treatment by "606" and the other metallic compounds only aggravates the condition, and I have frequently seen troops with the typical ulcerative gingivitis who were actually receiving treatment by "606" and other arsenic preparations at the time.

(*c*) *Dietetic.*

Lack of anti-scorbutic vitamins in the diet produces definite pathological changes in the gingivæ, as is well shown by the characteristic bleeding spongy gums in scurvy. During the war, the exigencies of the

campaign frequently led to the absence of vegetables and fruit in the diet, and there can be no doubt that this lack of anti-scorbutic vitamins produced a general lowering of vitality of the gingivæ and was a very important predisposing factor in the large number of cases of acute gingivitis which occurred.

The diet of the soldier to-day is almost devoid of fresh uncooked vegetables and fruit, but these are usually purchased in the canteens or outside barracks, and it is only when the soldier cannot obtain them that their absence in the routine diet is of significance.

Local Signs and Symptoms.

Clinically and bacteriologically, two varieties of the disease are recognized: a mild type, in which the disease is limited in extent of surface and does not penetrate the mucous membrane deeply; and a severe type, in which a great extent of surface is rapidly involved and the mucous membrane deeply penetrated.

(1) *The Mild Type.*

Here the *B. fusiformis* predominates and the symptoms may be tabulated thus :—

(*a*) Soreness and hyperæmia of the gum margin at the site of infection, lasting twelve to eighteen hours, followed by

(*b*) Œdema, increasing tenderness and free hæmorrhage on pressure, lasting about eighteen hours. The inflammation then spreads laterally by continuity of tissue and involves the gum margins of several contiguous teeth, the interdental gum papillæ being swollen.

(*c*) Ulceration now begins at the sight of infection and involves the whole circumference of the gum round the tooth. This ulceration spreads laterally and is first seen in the neighbouring interdental papillæ, which appear as if their crests had been snipped off. This appearance is due to the denudation of the epithelium of the crest.

(*d*) These points of ulceration increase in area as the tissues of the papillæ are progressively destroyed, and they coalesce to form a continuous line of ulceration on both the lingual and facial aspects, involving the gum margins of several contiguous teeth.

(*e*) At the same time, the opposite jaw is infected, and a similar process takes place in the gingivæ of the teeth which oppose those already involved.

The ulcerating surfaces are always covered by a greyish-white exudate and are exquisitely tender, due to exposure of nerve-endings.

(*f*) Ulceration spreads rapidly and always involves a certain depth of tissue, which depends upon the virulence of the organisms and the local resistance to the infection, but in every case a considerable destruction of the soft tissues round the teeth will take place. This destruction is always greatest between the teeth and shallow pockets are formed.

(*g*) If untreated, the crest of alveolus is involved and a certain destruction of bone results, which deepens the pockets.

During these changes the mouth becomes increasingly foul, owing to the cessation of tooth-brushing because of the tenderness; the saliva is thick and ropy and the catarrhal secretion from the gums aids the stagnation of food debris.

The mucous membrane of the cheeks in contact with the last molars is frequently attacked, the ulcers being shallow and very tender. Such a condition due to this milder type of infection is fully established in about six or seven days and is much more frequently seen than that due to the severe type.

The Severe Type.

In this form, the *S. vincenti* predominates and is found deep in the tissues in advance of the *B. fusiformis,* causing a much more severe and rapid destruction of soft and hard tissues. The initial stages are shorter and ulceration begins very early, spreading laterally and in depth with great rapidity, passing to the opposite jaw at once and spreading to the mucous membrane of cheeks, lips, floor of mouth, tongue, hard and soft palate, and uvula. It may be regarded as an acute necrosis of the investing tissues of the teeth, accompanied by an ulcerative stomatitis, the ulcers being multiple, much deeper than in the milder type and covered by a thicker greyish membrane.

The gingivæ appear as if they had been gouged out round the teeth, the alveolus is rapidly destroyed, owing to acute infection taking place very early in the condition following the loss of the protecting soft-tissue covering, and the teeth become progressively loose.

Such a condition can be fully established forty-eight hours after the commencement of ulceration and it was this type which became so prevalent during the war. When the tonsil is involved, Vincent's angina supervenes, with its possible complication of diffuse cellulitis.

To-day, fortunately, it is much less frequent, but, at any time, the milder form may develop into the severe if the local factors are favourable to the predominance of the spirochæte in the lesion and all gradations between the two extremes are met with.

Constitutional Symptoms.

(1) *The Milder Type.*

(*a*) Temperature is always above normal, varying from 99·8° to 102° F., depending upon the stage of the disease seen.

(*b*) The submaxillary and submental lymphatic glands are invariably enlarged and tender quite early in the condition, and the soldier sometimes reports sick for painful glands without mentioning his gums. The adenitis is generally bilateral, as the disease affects both sides of the mouth in nearly all cases.

(*c*) The breath is unpleasant, the saliva sticky, and the tongue may be furred.

(*d*) A certain degree of malaise and depression is apparent and is due to the toxæmia, disturbed sleep, constipation and under-nourishment because mastication of the ordinary diet is painful.

(2) *The Severe Type.*

The symptoms just described are much more marked and rapidly produced whenever the spirochætes have invaded the submucous tissues in great numbers.

(*a*) Temperature may rise to 103·5° F. or more in very bad cases.

(*b*) The adenitis is always bilateral, the glands more painful and markedly enlarged, and the cervical lymphatic glands are now affected as well. In very severe cases with ulceration of the tonsil and soft palate, it is usual for a certain degree of deep cellulitis to supervene if the disease is left untreated. This cellulitis may be unilateral or bilateral.

(*c*) The breath is very foul, the tongue furred and the oral cavity presents a marked degree of superficial sepsis.

(*d*) Malaise and depression are invariably produced in marked degree and the soldier is quite unfit for duty.

Importance of Early Diagnosis and Treatment.

It will now be seen that we are dealing with a condition which, in its milder form, is fully established in six or seven days, and in the severe form, in two or three days. It follows that the earlier the disease is recognized and treatment begun, the less will be the destruction of tissues and also the severity of the local and constitutional symptoms will be correspondingly decreased.

But there is another point to be considered, the importance of which must be strongly emphasized. *Wherever the ulceration of the gum margins between the teeth (the interdental papillæ) has penetrated to a greater depth than the floor of the gingival trough, the lost tissue is not replaced in its entirety and the gingivæ will never again be normal.*

In the March, 1926, issue of this Journal[1] I described in some detail the anatomy and histology of the dental tissues. It will be recalled that the gingival trough is a shallow depression, about one-eighth of an inch in depth, which surrounds each tooth at the neck. It is lined with a thin layer of squamous epithelium, and as long as this is intact, the underlying periodontal membrane and alveolus are cut off from the bacteria and fluids of the mouth. The gingival troughs of contiguous teeth are separated by a prolongation of gum—the interdental papilla—which completely fills in the triangular space under the points of contact of the teeth and prevents the impaction of food debris.

[1] "Dental Sepsis, its Nature and Systemic Effects."

The sequelæ of food impaction following loss of tissue at this site are indicated in the section on pathology in the article mentioned above. It was shown that a local injury was produced, followed by a breach of the wall of the gingival trough and succeeded by infection of the underlying periodontal membrane and alveolus.

The earlier treatment is begun the more chance there is of checking the ulceration before it reaches below the level of the trough. At the primary site of infection the tissue destruction has proceeded apace and no complete restoration can take place here; in its vicinity and especially where the crests of interdental papillæ are denuded of epithelium, it is often possible to overcome the ulceration in its earliest stages and induce entire replacement of tissue, provided the condition is diagnosed and treated in time. It is almost tragic to see the consequences of untreated acute ulcerative gingivitis, knowing that the pocketing between the teeth will induce, sooner or later, a true condition of dental sepsis, with absorption of toxins over a long period and eventual loss of several teeth.

Differential Diagnosis.

The diagnosis from pyorrhœa alveolaris, or gingivitis due to mouth-breathing and superficial sepsis, should present no difficulty. The rapidity of onset, the typical greyish-white membranous exudate covering the ulcers, the shallow ulceration of a continuous line of gum margin along several contiguous teeth, the rapid destruction of the interdental papillæ, the involvement of both jaws, and the marked constitutional symptoms, are pathognomonic. If any doubt exists, a simple bacteriological examination can be carried out as follows:—

Pick up a little of the exudate in a platinum loop, smear thinly on a slide and fix over a flame. Stain with methylene blue for about three and a half minutes, wash in water and dry. The typical *B. fusiformis* is readily recognized, and though the spirochæte is less deeply stained, it shows up quite well.

Incidence.

Examination of the records of this department, over a period of five years, shows that the disease occurs in about 2 per cent. of the troops attending and presents an interesting seasonal variation.

In the spring and summer months it is at a minimum, and gradually increases in frequency in the autumn, till it reaches a maximum incidence in December, January and February.

Treatment.

There must be many out-stations, especially abroad, where the troops are visited by a dental officer at infrequent intervals, or not at all. I therefore suggest a simple treatment, which medical officers could carry out if there is no dental officer available, and which requires no special instruments.

In acute ulcerative gingivitis the organisms are in the tissues under the membranous exudate, which is covered by a catarrhal secretion and sticky saliva. The application to be used must have the power of penetrating the saliva, secretion and membrane in order to reach the organisms, and it must be an effective germicide without being irritant or destructive to normal tissue.

Of the various drugs I have used, such as tincture of iodine, copper sulphate and potassium permanganate, none has been so effective as *chromic acid* (H_2CrO_4).

Chromic acid is an aqueous solution of the orange-coloured acicular crystals of chromium anhydride, CrO_3, which is stocked in the dispensary of nearly every station. It is a powerful deodorant and disinfectant, because of its oxidizing power and, as it coagulates albumen, it is also a very strong caustic.

It has an unpleasant and lingering taste, and it should be followed by the application of hydrogen peroxide, which at once removes the taste and combines chemically with the drug to produce a black or dark-brown perchromic acid.

If a drop of undiluted hydrogen peroxide is added to a few drops of concentrated chromic acid the orange colour is at once changed to a jet black. The reaction is presumably as follows:—

$$2\,(H_2CrO_4) + H_2O_2 = H_2Cr_2O_8 + 2\,(H_2O).$$

The strength recommended for use is 1 in 5, and not more than one ounce should be made at a time, as only a few drops are used at each treatment. The technique of the treatment is as follows:—

(1) Pour about twelve or fifteen drops of chromic acid into a small receptacle, such as a watch-glass, teaspoon, or glass top of an inkpot, and about double this quantity of undiluted hydrogen peroxide (10 vols.) into some similar small container.

(2) Roll small pieces of cotton wool into rolls about one-third the size of a walnut, preparing six of these.

(3) Flatten a wisp of cotton wool, about the size of a postage stamp, on the tip of the index finger of the left hand. Place the end of a silver probe in the centre of the wool, hold it rather loosely with the left thumb, and rotate the probe away from you with the right hand. A few turns will serve to fix the wool securely. If a probe is not available a match will serve.

(4) Place the patient in a chair in a position where good light enters the mouth without the head being tilted uncomfortably backwards. Have handy a spittoon, mug of warm water and a pair of tweezers.

(5) Let the patient spit in order to dry the mouth to some extent, stand at his right, raise the upper lip with the left hand and place a roll above the premolar teeth on each side. This exposes to view the gum margins of the incisors and canines.

(6) Dip the probe or match in the chromic acid to saturate the wool,

and apply to the enamel surface of the teeth, starting at the left bicuspid and passing horizontally across to the right bicuspid. The drop hanging from the wool will spread by surface tension over the labial ulcerating surface, and also pass between the teeth to their palatal aspect, thus reaching the entire area of affected tissue.

The probe should not be applied directly to the ulcers, as any pressure causes severe pain. The chromic acid itself, though a very powerful caustic, causes no pain or tingling. The patient should be warned not to swallow at any time during the treatment, and though the drug is a poison it can lie on the tongue and floor of the mouth for a short time and cause no harm. Two or three large drops at most are sufficient to cover the surface exposed.

(7) Let the acid remain *in situ* for at least one minute, during which the rolls will prevent its passing backwards along the cheeks to the throat. Remove the rolls and let the patient rinse the mouth thoroughly three times.

(8) Place a fresh roll posterior to the tuberosity of maxilla on the left side, raise the lip and cheek well away to expose the bicuspids and molars, and apply for one minute as before. The roll will absorb the excess and prevent its tracking into the throat.

(9) Remove the roll, let the patient rinse and gargle, and repeat on the right side. The upper jaw is thus treated in three sections, each application lasting one minute.

(10) The lower jaw is somewhat more difficult, as the gums cannot be kept dry so effectively. Turn down the lower lip, place a roll on either side, between the lip and first premolar, and apply to the incisors and canines for one minute. If the head is tilted back slightly, so that the floor of the mouth is inclined backwards, the saliva will not tend to dribble over the lip.

(11) The lower molars and bicuspids are more difficult to do because the saliva cannot be controlled. After the patient has rinsed and got the mouth as dry as possible, let him retract the left cheek with his little finger to expose the posterior teeth and apply the drug to the enamel surfaces facing the cheek, for one minute. It will run between the teeth to the lingual aspect and reach the ulcerating surfaces hidden from view, and though it may pass to the tongue, this is of no consequence.

If the mouth is very wet, and it is necessary for the patient to spit before the minute is up, two applications of half a minute each will simplify matters.

(12) Repeat on the right side.

The drug will have run over the lips, cheeks and part of the tongue, but this is unavoidable, and even desirable in moderation, as it tends to sterilize these surfaces, and so reduces the superficial sepsis. Wherever ulceration has occurred the acid will have penetrated the exudate and the true extent of the lesion will be shown up.

The effect of the drug on healthy gums and mucous membrane is simply to dissolve the slippery mucin which coats them, to sterilize their surface, and in strong solution to cause no more than a desquamation of the superficial layer of epithelium.

Any ulcers on the cheeks, palate, uvula, tongue and lips are touched with the saturated wool and the drug left for one minute before rinsing. When the tonsil is involved the tongue should be depressed to expose the ulcers, and one drop of the acid allowed to track over them by surface tension, and left for ten or more seconds, followed by thorough gargling.

Hydrogen peroxide of 10 vols. strength should now be applied three or four times by means of a small swab of wool to all the teeth and ulcers, still using the method of surface tension, and not direct application to the infected soft tissues.

If the peroxide is at full strength the typical reaction takes place at once, the entire surface turning jet black, while at the same time the solution of the mucin of the saliva, which normally renders the mouth slippery, will cause a characteristic dryish surface, lasting only a few minutes.

If the peroxide is weak, as is likely in tropical stations, the reaction will take longer, and will produce only a dark-brown colour. It should be left in the mouth till all yellowish colour has disappeared, and then the patient should rinse several times.

The soldier should be given five-grain tablets of potassium chlorate, three or four to be sucked daily between meals; a mild daily purgative prescribed; and the depression counteracted by a tonic such as stock No. 6 tablet.

Although the disease may seem localized at particular areas, or only on one side of the mouth, it is essential to treat the entire gum surface of each jaw, for careful investigation will show that, in every case, the epithelium of distant papillæ is infected long before ulceration at these sites is obvious.

The chromic acid (20 per cent. solution) should be applied in this fashion daily for three or four days, by which time the ulceration should be under control and the constitutional symptoms very much reduced, and thereafter, at intervals of two or three days, in a strength of 1 in 10 till resolution is practically complete and the sites of ulceration are covered by new epithelium.

It takes about seven days for this epithelial covering to form after all active signs of the disease have ceased, and it is during this period that relapse is common if the soldier fails to keep the mouth clean, and treatment is discontinued. The soldier's toothbrush should be sterilized at each attendance by soaking it in a strong germicide, such as five per cent lysol, during the ten or twelve minutes taken for the treatment, and then washed with water. Isolation is essential if the disease is of the severe type, and the chromic acid should be used twice daily until the rapid necrosis is checked.

Until the condition is brought well under control it is important not to

extract any loose or painful tooth, as the infection may be conveyed deep into the bone of jaw through the socket. I have seen extensive necrosis following extractions done when the condition was still acute.

Should an acute alveolar abscess arise it is better to make an incision into the swelling, evacuate the pus, and wait until the ulceration is less severe before removing the responsible tooth.

Subsequently, if a dental officer should visit the station, or be within reach, the soldier should be referred to him at the first opportunity for the treatment of any dental condition which might favour recurrence.

The advantages claimed for this treatment are :—

(1) Simplicity of application.

(2) Great effectiveness.

(3) Painlessness, although the lesions are so tender.

(4) Economy, only a few drops of chromic acid and hydrogen peroxide being used each time.

(5) No special instruments are required.

A TACTICAL SCHEME SET AT AN EXAMINATION FOR THE PROMOTION OF MAJORS TO THE RANK OF LIEUTENANT-COLONEL.

By Colonel E. P. SEWELL, C.M.G., D.S.O., V.H.S.

(*Continued from p.* 179.)

Task 2.

As A.D.M.S. 8th Division—

(1) Make a reconnaissance of the area Poona to Front, to ascertain the facilities for entraining and detraining casualties, and locations suitable for C.C.S.'s, Advanced Depot of Medical Stores, and Field Ambulance.

(2) Write Draft Orders for Divisional Operation Orders.

(3) Write Medical Operation Orders (Medical Instructions).

Solution of Task 2.

(1) Suitable sites for C.C.S.'s in Poona, are:—

(i) Council Hall.

(ii) Gymkhana Club and grounds.

Site for Advanced Depot Medical Stores is a building opposite and west of the Council Hall.

Facilities for entraining and detraining casualties at Poona Station are not good. Part of the long main line platform is the most suitable.

(2) Draft for insertion in 8th Division Operation Order No. 100.

November 20, 1925.

Reference Map 47 *F*/10, *No.* 47 *F*/14.

Medical Arrangements.

A.D.S. for right sector (23rd Infantry Brigade) is at junction of track from Chincholi with main Bombay-Poona road at Y. 58.04.

A.D.S. for left sector (25th Infantry Brigade) is at junction of track and main railway line at E 58.90.

W.W.C.P. is at Nigadia at E. 66.95.

M.D.S. is at B.M. 1835 on main railway line at E. 92.66.

Medical units will be in position at 06.00 on October 21, 1925.

October 20, 1925.

SECRET.
Copy No.

(3) 8TH DIVISION MEDICAL OPERATION ORDER, No. 1.

Reference Map, 47 *F*/10, *F* 1/14.

October 20, 1925.

(i) *Information.* (*a*) The enemy, estimated at two Divisions, has forced back the 8th Infantry Division, and is advancing along the Bombay-Poona road. (*b*) *Brownland.* The 8th Division is holding a line north and south between Kinhai (Y. 4520) and Raoat (E. 4786). The 9th Infantry Division is due to arrive at Poona on October 21.

(ii) *Intention* (of G.O.C. 8th Division). The 8th Infantry Division will stop the advance of the enemy on the line Kinhai (Y. 4520) and Raoat (E. 4786), the position will be occupied by the 23rd Infantry Brigade on the right and the 25th Infantry Brigade on the left. Boundaries between Brigade sectors (all inclusive to right sector) Poona-Bombay road. The 24th Infantry Brigade will occupy a position covering the main Bombay-Poona road as a divisional reserve.

Headquarters 23rd Infantry Brigade is at Y. 6312.
,, 24th Infantry Brigade is at 13 M.S.
,, 25th Infantry Brigade is at E. 5897.

(iii) *Method of Execution* (Medical).

(1) No. 25 F.A. will form a M.D.S. at B.M. 1835 on main railway line at E. 92.66.

(2) Two sections of No. 23 F.A. will form an A.D.S. for the right sector at junction of track from Chincholi with main Bombay-Poona road at Y. 4804.

(3) Two sections of No. 23 F.A. will form an A.D.S. for the left sector at junction of track with main line at E. 5890.

(4) One section of No. 24 F.A. will form a W.W.C.P. at Nigadia at E. 66.95.

(5) Headquarters and two sections No. 24 F.A. will be in reserve at Chinchvad at E. 78.83.

(6) ½-Bearer unit is attached to A.D.S. of the right sector.
½-Bearer unit is attached to A.D.S. of the left sector.
Bearer collecting posts will be established by O.C.'s A.D.S.'s.

(7) *Evacuation.* Divisional motor ambulances will be pooled and will clear casualties from A.D.S. of right sector, and from point on Bombay-Poona road E. 63.99 (i.e., nearest point to A.D.S. of left sector), to M.D.S.

One car will be posted at Nigadia.

Car post of four cars at Chinchvad R.S. E. 78.83 and six cars at M.D.S.

Q. will arrange to have twenty lorries of supply column to be at W.W.C.P. at Nigadia E. 66.95.

Bearers, bullock tongas and riding ponies clear from R.A.P.'s to A.D.S.'s and to (1st) car post.

The sanitary section is attached to M.D.S.

(iv) *Administrative Details.*

(1) Water. All pukkhals and water bottles of units will be filled with chlorinated water before positions are taken up.

(2) Supplies for consumption of October 21 will be issued at 20.00 hours on October 20 at Chinvad R.S. E. 78.83.

(3) Dumps (under arrangements made by D.D.M.S. 3rd Corps), ten stretchers and twenty blankets at each R.A.P., 100 stretchers and 200 blankets at each A.D.S.

(v) *Intercommunication.* Communication will be established between A.D.S.'s, Brigade Headquarters, A.D.M.S., and M.D.S. by runners, motor cyclists and telephone. Reports (as per standing orders) to A.D.M.S. at advanced Divisional Headquarters at road junction (Y. 5904).

Acknowledge.

Issued to Signals at 16.00, October 20.

Copy No. 1. No. 23 Field Ambulance.
2. No. 24 Field Ambulance.
3. No. 25 Field Ambulance.
4. O.C. Bearer Unit.
5. Sanitary section.
6. 23rd Infantry Brigade.
7. 24th Infantry Brigade.
8. 25th Infantry Brigade.
9. D.D.M.S., 3rd Corps.
10. "A" and 2.

Copy No. 11. "G."
12. O.C.R.A.
13. O.C.R.E.
14. A.D.M.S. 9th Division.
15. D.A.P.M.
16. File.
17. File.
18. Diary.
19. Diary.

Colonel,
A.D.M.S. 8th Division.

Criticism of Task 2.

(i) The sites selected are considered the most suitable. Reasons for their selection might have been given, e.g., a large building with plenty of space round it for pitching tents, adequate piped water supply, electric light, ample facilities for approach, and proximity to railway stations of both standard and metre-gauge railways.

(ii) Draft for Operation Orders is clear, concise and in correct form. The position of the main dressing station (about eight miles behind the position) is considered too far back, even in view of the fact that a retirement is probable. Main lines of evacuation of wounded should be indicated.

(iii) *Medical Operation Orders.*

(*a*) The form is correct, with the exception that it is considered better to put the " Intention (of the G.O.C. 8th Division) " in a subheading under " Information."

(*b*) The M.D.S. should be at Chinchvad.

(*c*) The A.D.S. for the right sector should be further forward in the neighbourhood of Chincholi, where some cover exists in nullahs. Otherwise a very long carry from R.A.P. to A.D.S. results. This is unnecessary as wheeled transport can be used on the track from Chincholi, which is concealed from direct observation by the ridge of ground to the west of it.

(*d*) The position of the A.D.S. for the left sector, though not a good one, is the best available.

(*e*) The position of the Field Ambulance (No. 24) held in reserve is considered too far back.

(*f*) A better arrangement of medical units is considered to be :—

No. 23 Field Ambulance.

One section forms A.D.S. for right sector.

One section forms W.W.C.P. at Nigadia.

Headquarters and one section at junction of Chincholi track with Bombay-Poona road closed and to assist transferring cases from bullock tongas to motor ambulances.

No. 25 Field Ambulance.

One section forms A.D.S. for left sector.

Headquarters and three sections form M.D.S. at Chinchvad.

No. 24 Field Ambulance.

In reserve near Point 2062.

(*g*) Under " administrative instructions " it should not be necessary to order that water bottles, &c. should be filled in Operation Orders. This should be a Standing Order.

NARRATIVE 2.

(To be given out at 9 a.m., October 21.)

Yellow attacked Brown's position at dawn on 21st along the Bombay road and railway with one division. The 8th Division held its position with moderate casualties,[1] until at 9 a.m. a strong force of the enemy were reported to be advancing on the right of Brownland's position, along the

[1] Casualties about 800, evenly divided between the 23rd and 25th Brigades, have been received into Field Ambulances, and are in process of being evacuated to the Main Dressing Station at Chinchvad.

D.D.M.S. Corps undertakes evacuation of Main Dressing Station with M.A.C., and puts thirty motor ambulances at the disposal of A.D.M.S. 8th Division.

The transport of a Field Ambulance may be assumed to be four motor ambulances, in addition to their normal transport.

road north of the Indrayani river towards Khalumbre. A general retirement was ordered at 9 a.m. to a previously prepared line stretching from the Pauna river near B.M. 1835 and the eighth milestone on the Bombay road to Point 1944 west of Bhavsari on the Kirkee-Nasik road.

The following verbal Operation Orders were issued :—

Verbal orders issued by General Staff, 8th Infantry Division, to Brigade Commanders, Staff Officers and heads of services.

Time 09.15 hours, October 21.

Information.

(*a*) The enemy estimated strength 1st Infantry Division has been repulsed along our front; a strong body of the enemy is reported advancing along the Chakan-Khalumbre-Induri road towards Khalumbre; (*b*) The 9th Infantry Division will not be able to march from Poona before 12 noon to-day.

Intention.

The 8th Infantry Division will withdraw to a previously prepared position covering Point 1914 (F. 0375)-8 M.S. Poona-Bombay road with the left flank resting on the Pauna river about E. 8963. This position will be occupied by the 24th Infantry Brigade by 14.00 hours to-day.

Method of Execution.

The following troops will march immediately to occupy the position. 24th Infantry Brigade :—

1st Battery 20th Field Artillery Brigade; 1st Battery 21st Field Artillery Brigade, and P. Artillery Brigade, less two batteries, under command of the Officer Commanding, P. Artillery Brigade.

Artillery units are affiliated to 24th Infantry Brigade. The route will be as follows : Point 2053 (Y. 6203)-Point 1969 (E. 8789)-Point 1944 (F. 0374).

The withdrawal of the 23rd Infantry Brigade and 25th Infantry Brigade will commence at 10.00 hours, and will be regulated by the pace of the 23rd Infantry Brigade.

Boundary between Brigades main Poona-Bombay road inclusive to 23rd Infantry Brigade.

The withdrawal will be conducted by bounds as follows :—

1st Bound : Point 1969 (Y. 6312)-Point 2342 (Y.5402)-bridge over Pauna river at Raoat (E. 4786).

2nd Bound : Point 1969 (E.8789)-Chinchvad R.S.-Chinchvad.

The 23rd Infantry Brigade will withdraw into reserve at Point 1914 (F. 1165).

The 25th Infantry Brigade will withdraw into reserve at 4½ M.S. Poona-Bombay road.

Artillery.

C.R.A. will be responsible for covering the withdrawal of the 23rd and 25th Infantry Brigades.

Engineer.

Detailed orders have been issued to R.E. units by the C.R.E. They will not be available for Brigade Commanders.

No demolitions will be carried out during the withdrawal.

Administrative.

Supply and ammunition. Issued separately.

Medical.

Issue verbal orders as A.D.M.S. as given at conference of Brigade Commanders and Staff Officers, etc.

Intercommunication.

Advanced District Headquarters will close at Road Junction (Y. 5904) at 09.30 hours and open at Chinchvad R.S. at the same time, where it will remain until the 1st Bound has been carried out. Then to Point 1914 (F. 1565). Div. H.Q., R.A. and R.E. will close at Chinchvad R.S. at 10.30 hours and open at Wireless Station (F. 2055) at the same time.

Headquarters, 23rd and 25th Infantry Brigades and R.A. Brigade will establish adjacent H.Q.'s. on the main Poona-Bombay road and will keep advanced D.H.Q. informed of their exact location.

Task 3.

As A.D.M.S., 8th Division:—

(1) Attend the conference of Brigade Commanders and Staff Officers, etc., and be prepared to state how the evacuation of casualties is progressing, and how long it will take to clear the A.D.S.'s.

(2) After the conference write the necessary orders to Field Ambulances in message form.

Notes on Task 3.

Narrative No. 2 with the verbal orders issued by the General Staff were given out, and the candidates allowed about an hour to digest them and to make their plans. They were then summoned singly before the Board, and required to imagine themselves at a Staff Conference at 09·15 hours. The Staff were anxious to commence the retirement as soon as possible, and wished to know when the evacuation of casualties would be advanced

enough to permit of the first bound being made. As the distance to be covered on the right flank during the bound was considerably greater than that on the left, the crucial question was the rate of evacuation from the right Advanced Dressing Station, where about 400 casualties had to be collected and evacuated to the car post on the main Bombay-Poona road. This part of the evacuation involved hand carriage from Regimental Aid Posts to the A.D.S. of about a mile over rough and exposed country, and transport in bullock tongas and on riding ponies for one and a half miles from the A.D.S. to the car post. Although only three hours had elapsed from the commencement of the attack, the majority of the candidates stated that the evacuation was well advanced, and that a considerable proportion of the casualties were already in the M.D.S. at Chinchvad. In the opinion of the Board this was not possible; and it was probable that the first batch of wounded were then only just arriving at the car post. Taking twenty per cent of the 400 casualties as lying-down cases, there are eighty such cases to be carried in the twelve bullock tongas of the field ambulance. A bullock tonga progresses at the rate of only two miles an hour, and carries only two lying-down cases. The tongas will, therefore, take at least one and a half hours over the round trip, and carry twenty-four lying-down cases at each trip. It will take at least six hours, therefore, to remove the eighty lying-down cases with the twelve tongas of the field ambulance, and the A.D.S. will not be clear until 13.00 hours. There would be no chance of getting away all the wounded, unless the A.D.M.S. had foreseen the likelihood of a retreat, and previously ordered up all the transport of the Field Ambulance in reserve to a point within easy reach of the A.D.S., such as the road junction (Y 5904). If this provision had been made the time of evacuation might have been reduced by half, and the A.D.S. clear by 10.00 hours. As it is the majority of the wounded would be captured.

(2) The Board considered that the best arrangements for the retirement are as follows:—

1*st Bound*.—No. 24 Field Ambulance moves back to Dapuri and opens a main dressing station there.

No. 23 F.A. conforms to the movements of the 23rd Infantry Brigade, retiring along the road which runs to Poona via the Wireless Station.

No. 25 F.A. The A.D.S. on the left flank (E 5890) remains open. The M.D.S. at Chinchvad evacuates the wounded as rapidly as possible and prepares to retire.

2*nd Bound*.—No. 23 F.A. continues its retirement, carrying wounded back with it, and evacuating them to the M.D.S. at Dapuri.

No. 25 F.A. M.D.S. and A.D.S. close and retire along the Bombay-Poona road, carrying wounded back and evacuating to Dapuri.

3*rd Bound*.—No. 23 F.A. accompanies the 23rd Brigade into its reserve position at Point 1914.

No. 25 F.A., less two sections, retires to Dapuri.
Two sections form an A.D.S. in the neighbourhood of Kasarvadi.

NARRATIVE 3.

(Given out at 8 a.m. on 22nd.)

After a series of rearguard actions the line was reached at 6 p.m.

In the meantime the 9th Division, marching up the Alandi road and the tracks connecting the two roads, reached the Nasik road about the same time and took up a position facing north and west on the high ground south of Moshi.

The Cavalry Brigade occupied the gap between the 8th and 9th Divisions, and was attached to the 9th Division for orders.

The following Operation Orders III were issued:—

SECRET.
Copy No. ......

9TH DIVISION OPERATION ORDER, NO. 90.

Reference Map, Poona District, 47 *F*/10 *and F*/14, 1 *inch to* 1 *mile.*

October 21, 1925.

Information.

(*a*) The enemy, estimated at 1st Infantry Division, are advancing south-east along the Poona-Bombay road.

(2) A column was reported at 09.00 hours to-day advancing along the Chakan-Induri road.

(*b*) 24th Infantry Brigade is occupying a position from about Point 1944 (F 0375) south-west to the Pauna river (E 8963) covering Bhavsari and Kasarvadi.

(2) The 23rd and 25th Infantry Brigades are withdrawing behind this line and are expected to clear the front by 18.00 hours.

Intention.

The 9th Infantry Division will take up a defensive position facing north and west on the high ground about half a mile south of Moshi.

The Cavalry Brigade will cover the gap between the 2nd Divisions and is attached to the 9th Infantry Division.

Execution.

The 26th Infantry Brigade on the right and 27th Infantry Brigade will occupy a position including the following localities: Point 2008 (Z 2107)-Wells (Z 10) central-12 M.S. Moshi road-high ground (F 0395).

Boundary between sectors 12 M.S. Moshi road-nullah running from F 1098 to F 1591, all inclusive to the right Brigade.

The 28th Infantry Brigade will be in the Divisional Reserve near the 10th M.S. Moshi road.

(2) *Artillery.*

22nd "F" Battery R.A. will cover the right sector.

23rd "F" Battery R.A. will cover the left sector.

40th "P" Brigade R.A. will be in reserve south of Point 2023 (F. 2181) and will reconnoitre for gun positions covering the gap between the 8th and 9th Infantry Division.

Anti-tank defence will be arranged by the C.R.A. over the Divisional front in consultation with the C.'s C. Infantry Brigades and C.R.E.

(3) Cavalry Brigade will remain concentrated in nullahs south of Point 2023 (F. 2181) and will be ready to move to occupy the gap between the 8th and 9th Divisions.

Standing patrols as under will be posted before dark :—

(*a*) Cross tracks (E. 9293).

(*b*) Cross tracks (F. 0684).

Patrols will be withdrawn at 06.30 and will report situation to D.H.Q.

Engineers.

Special instructions have been issued to R.E. units for employment in rear of the Division.

R.A.F.

(*a*) O.C. No. 3 (A.C.) Squadron R.A.F. will arrange to maintain one artillery and one close reconnaissance machine on the front of the Division during the hours of daylight, October 21, from 06.30 hours on October 22. Front Infantry Brigades will mark dropping stations immediately their H.Q.'s are established, reporting their sites to D.H.Q.

(*b*) Anti-aircraft defence. Defence against high-flying aircraft is being provided under Corps arrangements. Brigade Commanders are responsible for their own protection against low-flying aircraft.

Administrative.

Ammunition and supplies

A.R.P. will be opened at Ghorpuri Troop Siding.

S.R.P. will be opened at Ghorpuri Troop Siding.

Meeting place at Dighi.

Medical.

To be issued by A.D.M.S., 9th Infantry Division.

Intercommunication.

D.H.Q. will close at Poona at 14.00 hours 22nd and open at 8th M.S. Dighi-Poona road at the same time.

H.Q. 26th Infantry Brigade will open on track (F. 2093) at 17.00 hours.

H.Q. 27th Infantry Brigade will open at Point 2038 (F. 1188) at 17.00 hours.

H.Q. 28th Infantry Brigade will open at 10 M.S. Moshi-Bhavsari road at 17.00 hours.

H.Q. Cavalry Brigade will open at Point 2023 (F. 2181) at 16.00 hours.

Acknowledge.

Colonel, General Staff,
9th Infantry Division.

Issued to Signals at 12.00 hours, October 21.
Distribution as per Order of Battle.

Task 4.

As A.D.M.S., 9th Division, write :—

(1) Draft Order for 9th Divisional Operation Orders.

(2) Medical Operation Orders.

Solution of Task 4.

(1) Draft for insertion in 9th Divisional Operation Order, No. 90, of October 21.

Medical Arrangements.

(1) A.D.S. for 26th Brigade right sector, is at junction of tracks at F. 29.98.

(2) A.D.S. for 27th Brigade, left sector, is at Point 2038 on Moshi-Dapuri road at F. 12.88 at road junction.

(3) W.W.C.P. is at road junction at F. 2578.

(4) M.D.S. is at Dighi, F. 2468.

Medical units to be in position at 06.00 hours, October 22.

Colonel, A.D.M.S.,
9th Division.

October 21, 1925.

SECRET.
Copy No. ......

9th Division Medical Operation Order, No. ......

Reference Map, No. 47 *F*/10, *F*/14.

October 21, 1925.

I. *Information.*

(*a*) The enemy, estimated at 1st Infantry Division, are advancing south-east along the Poona-Bombay road. A column was reported at 09.00 hours to-day advancing along the Chakan-Induri road.

(*b*) The 24th Infantry Brigade (8th Division) have taken up a position from Point 1944 (F. 4375) south-west to the Pauna river (E. 8963).

(c) *Intention* (of G.O.C. Division).

The 9th Division will hold a defensive position. The 26th Infantry Brigade hold the right sector, and the 27th Infantry Brigade are holding the left sector; the position runs from Point 2008 (Z. 2107) Wells (210 central)-12th M.S. Moshi road to (F. 0395).

The 28th Infantry Brigade are in reserve at 10th M.S. Moshi-Bhavsari road.

H.Q. 26th Infantry Brigade is open on track F. 2093 at 17.00 hours.

H.Q. 27th Infantry Brigade is open at Point 2038 (F. 1188) at 17.00 hours.

H.Q. 28th Infantry Brigade is open at 10th M.S. Moshi-Bhavsari road.

The Cavalry Brigade is concentrated in nullahs south of Point 2023 (F. 2181) and is ready to move to occupy the gap between the 8th and 9th Divisions.

II. *Method of Execution (Medical).*

(1) Three sections of 27th F.A. will form a M.D.S. at Dighi, F. 2468.

(2) One section of 27th F.A. will form an A.D.S. for the left sector. (27th Infantry Brigade) at Point 2038 on Moshi-Dapuri road at F. 1288 at road junction.

(3) Two sections of 26th F.A. will form an A.D.S. for the right sector (26th Infantry Brigade) at junction of tracks at F. 29.98.

(4) Two sections of 26th F.A. will form a W.W.C.P. at road junction at F. 2578.

(5) The 28th F.A. will be in reserve at the tenth milestone, Moshi-Dapuri road.

(6) The Cavalry Field Ambulance will be closed and ready to move at Point 2023 (F. 22.83).

(7) ½-Bearer unit is attached to A.D.S. of left sector.
½-Bearer unit is attached to A.D.S. of right sector.

(8) The sanitary section is attached to M.D.S.

(9) Evacuation.

From A.D.S.'s to M.D.S. by Division motor ambulances of the respective F.A.S.

O.C. 28th F.A. will send his cars to assist if necessary.

From R.A.P.'s to A.D.S. by tongas, stretcher bearers and riding ponies.

All Medical units to be in position at 06.00 hours on October 22.

III. *Administrative Details.*

(1) Water. All pukhals and water bottles of units will be filled with chlorinated water before positions are taken up.

(2) Supplies for consumption of 23rd will be issued at Dighi F. 2468 20.00 hours, October 22.

(3) Dumps (under arrangements made by D.D.M.S. 3rd Corps). There will be a dump of 20 stretchers and 40 blankets at each R.A.P. and 100 stretchers and 200 blankets at each A.D.S.

V. *Intercommunication.*

Communication will be established between A.D.S., M.D.S., Brigade Headquarters and A.D.M.S. by runners, motor cyclists and telephone.

Reports to A.D.M.S. at D.H.Q. at 8th M.S. Dighi-Poona road (open at 14.00 hours, October 22).

Acknowledge.

Issued to Signals at 14.00 hours, October 21.

Copy No. 1. O.C. No. 26 F.A.
2. No. 27 F.A.
3. No. 28 F.A.
4. Cavalry F.A.
5. Bearer unit.
6. Sanitary section.
7. H.Q. 26th Infantry Brigade.
8. H.Q. 27th Infantry Brigade.
9. H.Q. 28th Infantry Brigade.
10. Cavalry Brigade.

Copy No. 11. "A" and 2.
12. "G."
13. O.C., R.A.
14. O.C., R.E.
15. D.A.P.M.
16. D.D.M.S.
17. File.
18. File.
19. Diary.
Diary.
20. A.D.M.S. 8th Division.

Colonel, A.D.M.S.
9th Division.

CRITICISM BY THE BOARD OF EXAMINERS.

The form of the draft and of the Operation Orders is correct, and the orders are good and clearly expressed. There is a tendency to site medical units by the map, instead of by inspection of the ground. Thus, Point 20.38 is not a suitable position for an A.D.S., as it is fully exposed to view, and is on a high, bare plateau, whereas a very suitable position for an A.D.S., shady and out of sight of the enemy, exists at the eleventh mile-stone, less than a mile away.

Similarly, the position for the Cavalry Field Ambulance has been indicated as Point 2023, instead of in the nullahs near by.

The Officer Commanding 28th Field Ambulance is ordered to "send his cars to assist if necessary." There is no indication as to how he is to know if it is necessary. Orders should be issued by the A.D.M.S. when the necessity arises.

NARRATIVE IV.

At 10 a.m., on October 22, Yellow troops attacked Brown's positions all along the line with great determination. Fighting was very severe, especially on the right flank. It lasted until dark, when the enemy drew off without having obtained any decision.

In the meantime the 1st Division of Brown's Northern Army arrived at Poona and marched to Aundh, where they bivouacked for the night, October 22-23.

On the morning of October 23 the enemy showed no signs of attacking, and it soon became evident that the threat to his right flank had induced him to retire.

The 1st Division, 9th Division and Cavalry Brigade were ordered to advance and follow up the retreat of the enemy, the 8th Division being too exhausted to move.

At 2 p.m. the position was: The 1st Division is advancing along the old Bombay road without much opposition. The enemy's rearguard has taken up a strong position on the southern slopes of Hill 2342 to Hill 2053, and the 9th Division have been ordered to attack it. At this hour the 9th Infantry Division is disposed as under:—

Right Column.	Head of vanguard of 26th Infantry Brigade held up on nullah one-half mile north-west of Point 1969 (E. 8789).
Remainder of Column.	26th and 27th Infantry Brigades. 22nd Field Brigade, R.A. 1st Pack Brigade, R.A. 26th and 27th Field Ambulances.
Left Column.	Head of vanguard of 28th Infantry Brigade held up about 11th M.S. Poona-Bombay road.
Remainder of Column.	28th Infantry Brigade. D.H.Q. 23rd Field Brigade, R.A. R.E. 1st Field Ambulance. Divisional train and ammunition column.

The Cavalry Brigade has advanced across country and is in the neighbourhood of Dehu preparing to harass the enemy's retreat along the Bombay road.

SECRET.
Copy No. ......

9TH DIVISION OPERATION ORDER, NO. 95.

Reference Map, Poona District, 47 F/10 *and* F/14, 1 *inch to* 1 *mile.*

October 23, 1925.

Information.

(*a*) The enemy have been repulsed with heavy losses all along our front and are retreating westwards. The enemy are reported

to be holding a rearguard position from about Hill 2053 to Hill 2342.

(*b*) 9th Infantry Division is advancing along the roads Point 1914 (F. 1165), 1944 (F. 0375), 1969 (E. 8789) and Poona-Bombay road.

Right Column.	Head of vanguard of 26th Infantry Brigade held up on nullah, half mile north-west of Point 1969 (E. 8789).
Remainder of Column.	26th and 27th Infantry Brigades. 22nd Field Brigade, R.A. 1st Pack Brigade, R.A. 26th and 27th F. Ambulances.
Left Column.	Head of vanguard of 28th Infantry Brigade held up about 11 M.S., Poona-Bombay road.
Remainder of Column.	28th Infantry Brigade. D.H.Q. 23rd Field Brigade, R.A. R.E. 28th Field Ambulance. Divisional train and ammunition column.

1st Infantry Division is advancing along the old Bombay road without much opposition.

1st Cavalry Brigade has reached vicinity of Dehu, where it is operating on the enemy's right.

Intention.

The 9th Infantry Division and 1st Cavalry Brigade will attack the enemy and endeavour to cut off their retreat.

Method of Execution.

Infantry.—The 26th Infantry Brigade on the right and 28th Infantry Brigade on the left will attack the position Hill 2053-Hill 2342.

Dividing line between Brigades, Poona-Bombay road inclusive to right brigade.

27th Infantry Brigade will be in Divisional Reserve and will advance by bounds as follows: 1st Bound, Point 1969 (E. 8739); 2nd Bound, rear of Hill 2062 (E. 7579), and will be prepared to advance on the right of the 26th Infantry Brigade in the direction of Hill 2207 (Y. 5017). The 27th Infantry Brigade will move to its second position when the 26th Infantry Brigade has reached the line of the foot-hills.

No troops of 26th and 28th Infantry Brigades will move forward of the line cross-road (E. 8392)-11 M.S. Poona-Bombay road before 16.00 hours.

Cavalry.—1st Cavalry Brigade will move forward at an hour to be notified later, and block the retreat of the enemy, placing themselves astride the Poona-Bombay road between the Indrayani River at Point 1902 (Y. 2822) and Hill 2712. Representatives of Cavalry Brigade H.Q. will report to the D.H.Q. forthwith.

Artillery.—C.R.A. will detail 2 P. Batteries R.A. to come under the orders of the C.'s C. 26th and 28th Infantry Brigades.

The 22nd Field Brigade, R.A., and 1 P. Artillery Brigade, R.A. (less 2 Batteries), will support the right Brigade.

The 23rd Field Brigade, R.A., will support the attack of the left Brigade.

1st Battery R.H.A. will support the advance of the 1st Cavalry Brigade.

Mutual support along the Divisional front will be co-ordinated by the C.R.A.

Engineers.—R.E. units will be in reserve at D.H.Q.

Aircraft.

O.C. No. 3 (A.C.) Squadron R.A.F. will arrange to maintain one artillery and one close reconnaissance machine on the Divisional front during the hours of daylight on October 22.

Front Infantry Brigades will mark dropping stations and report their sites to D.H.Q.

1st Flight (No. 4 (A.C.) Squadron has been allotted for use of the 1st Cavalry Brigade and will co-operate with their advance.

Administrative.

S.R.P. will be opened at Dapuri.

A.R.P. will be opened at Dapuri.

Meeting place for Infantry Brigades and 1st Cavalry Brigade, Chinchvad R.S.

Medical.

To be written as A.D.M.S., 9th Infantry Division, and attached Cavalry Brigade.

Intercommunication.

D.H.Q. will close at Bhavsari at 14.00 hours and open at Chinchvad R.S. at the same hour.

26th and 28th Infantry Brigades and 22nd and 23rd Field Brigades, R.A., will establish adjacent H.Q.'s on the Poona-Bombay Road.

H.Q. 27th Infantry Brigade will be established at Point 1969 (E. 8789) until the attacking infantry has reached the line of foot-hills, when it will move to Hill 2062 (E. 7699).

Cavalry Brigade will establish Brigade H.Q. in accordance with the orders issued for their advance.

O.C. Divisional Signals will co-ordinate the communications throughout the Division and attached Brigade.

Acknowledge.

Colonel, General Staff,
9th Infantry Division.

Issued to Signals at 14.00 hours.
Distribution as per Order of Battle.

Task 5.

As A.D.M.S., 9th Division, state verbally medical arrangements for attack of 9th Division and 1st Cavalry Brigade.

Task 5.

The last day's work was all practical and oral. Candidates were required to set their maps and to identify certain landmarks, to recognize map positions on the ground and to choose suitable sites for A.D.S.'s and M.D.S.'s.

They were also required to state verbally their proposed arrangements for the attack and pursuit of the enemy.

The situation presented no special difficulties, and it was judged correct to open one Divisional Main Dressing Station at Chinchvad and A.D.S.'s at Nigadia and behind Point 2062. The Cavalry Field Ambulance would remain closed as long as possible, evacuating wounded into the Infantry Dressing Stations. If any serious opposition developed it would probably be necessary for the Cavalry Field Ambulance to open at Dehu.

General Criticism.

Candidates, as a whole, displayed lack of experience in writing orders, as might be expected considering how seldom they are afforded any opportunities of practice.

Map reading and eye for country were also weak points, and were due to the want of facilities for practical work in the field.

MARCH DISCIPLINE.

By Captain and Quartermaster G. A. COLLIER.
Royal Army Medical Corps.

General rules for marches and maintaining discipline are given in the Field Service Regulations, vol. ii, 1924, Chapter XII; the Field Service Pocket Book, Chapter II; Infantry Training, vol. i, 1922, Chapter IX; Training and Manœuvres Regulations 1923, Sec. 73; Manual of Military Hygiene, 1921, Chapter X; and the Army Manual of Sanitation, 1926, paras. 159 to 165.

March discipline is defined as including everything which affects the efficiency of men during the march (Field Service Regulations, vol. ii, Sec. 150). Great importance will be attached to march discipline (Training and Manœuvre Regulations, Sec. 73).

Good march discipline reflects *esprit de corps*; in a platoon moving well, the weaker man is unconsciously helped by the stronger man.

The fighting spirit, discipline and *esprit de corps* of a unit are bound up in its physical fitness. The keen, disciplined and efficient fighting man requires a sound mind and a fit body.

Discipline, comfort and reduction of fatigue depend entirely on the strictest attention to march discipline (Infantry Training, vol i, Chapter XI, Sec. 128).

The various points to be attended to fall under three main headings:—

(1) Preparation before the march.
(2) During the march.
(3) Arrangements at the end of the march.

Boots and Clothing.

Officers commanding companies will personally see that boots are carefully fitted in accordance with the instructions given in Appendix 4 and para. 241 of the Clothing Regulations.

At these inspections the man should be in full marching order, as the fit of the boots is altered when the man is carrying a load.

Appendix 4 of the Clothing Regulations also contains instructions for fitting clothing.

Before commencing a march platoon commanders should inspect the men's feet and socks, as well as the fit of their boots (Infantry Training, vol. i, Sec. 129).

The causes of sore feet are ill-fitting boots and socks, combined with uncleanliness.

The feet should be washed at least once a day, as retained sweat and dirt damage the skin and render the feet more liable to injury. If washing

is impossible, the feet should be wiped over with a damp cloth, especially about the toes (Field Service Pocket Book, Sec. 6, para. 21).

The regimental chiropodist should attend the medical officer's inspection of men, and all feet inspections by unit officers. A book should be kept and a note made of any man whose feet require skilled attention or treatment by a medical officer (Regulations A.M.S. para. 389).

A soldier may be employed as chiropodist in any dismounted unit having an establishment of not less than 100 dismounted non-commissioned officers and men when the general officer commanding considers the services of a chiropodist necessary (Army Council instructions to Article 830 of the Royal Warrant for pay, etc.).

The training of chiropodists is arranged as directed in para. 836, King's Regulations. Their duties are to teach men how to look after their own feet, and to treat such minor disabilities as corns, ingrowing toe nails, blisters and sweaty feet.

The Handbook of Chiropody deals with the covering of the soldier's feet, i.e., boots and socks, in Chapter II. The care of the soldier's feet in barracks and on the line of march, is dealt with in Chapter III. The chapter ends, "comfortable boots and cleanliness is the key to prevention of the diseases to which the soldier's feet are liable."

The treatment of common ailments to which the feet are liable, viz., blister, abrasion, cut or wound, abscess, corns, chilblains, sweaty feet, ingrowing toe-nails and bunions, is given in Chapter IV.

Equipment should be fitted to prevent discomfort and chafes (Infantry Training, vol. i, Sec. 129).

Greatcoats.—When greatcoats are not carried by troops, during training periods, ground sheets may be issued from regimental stores (A.C.I. 259 of 1924).

WATER DISCIPLINE.

Water is not to be kept in the water-bottle when the bottle is not in use (King's Regulations, para. 971).

Before commencing a march the men's water-bottles should be cleaned, and examined by platoon commanders (Infantry Training, vol. i, Sec. 129).

Dirty water-bottles may easily become a source of danger to health. The necessity of frequently cleaning them out with boiling water, or chemicals provided for the purpose, must be borne in mind. Water-bottles must be periodically inspected by a medical officer in addition to frequent inspections by platoon and company commanders.

The importance of "water discipline" must be recognized. Men must be trained to economize the contents of their water-bottles and be prevented from drinking water which is not pure. Unit standing orders must include instructions regarding water discipline on the line of march. Water-bottles[1] must be full (weak tea or sterilized water) before the march is

[1] The capacity of a water-bottle is one and three-quarter pints.

started, and care must be taken to prevent them being refilled from unauthorized sources (Field Service Regulations, vol. ii, Secs. 156 and 173).

Marching.

Troops should always receive a meal before an early morning start or a night move (Field Service Regulations, vol. ii, Sec. 173 (2)).

The length of pace is thirty inches. In quick time 120 paces are taken in one minute which equals 3 miles, 720 yards in an hour (Infantry Training, vol. 1, Sec. 23).

Column of fours is the ordinary marching formation of infantry (Infantry Training, vol. i, Sec. 128).

Marching in line is fatiguing for the troops (Field Service Regulations, vol. ii, Sec. 151 (2)).

On unenclosed ground it may sometimes be advisable to march on a broader front than in a single column in the normal march formation. It is better to march in a formation composed of several columns abreast than in line formation (Field Service Pocket Book).

When there is no possibility of meeting an enemy the order of march of the main body will depend chiefly on the comfort of the troops (Field Service Regulations, vol. ii, Secs. 149 and 153).

The average march under normal conditions for a large column of all arms is two and a half miles an hour, including short halts, and fifteen miles a day, with a rest at least once a week ; small commands of seasoned troops can cover twenty-five miles a day under favourable conditions (Field Service Regulations, vol. ii, Sec. 152 (5)).

As a general rule the marching rate for mounted troops should be about five miles an hour, including short halts. The length of a day's march may be reckoned at from twenty to twenty-five miles (Cavalry Training, vol. i, Sec. 237).

The rate of marching throughout a column should be uniform. Alternate checking and hurrying is most exhausting to the troops (Field Service Regulations, vol. ii, Sec. 152).

Mounted officers, motor-cars and motor-cycles will avoid passing and repassing infantry more than is absolutely necessary, and if it is necessary to do so, should, when possible, take advantage of halts for the purpose.

Motor vehicles, when passing dismounted troops, will do so at as slow a pace as possible to avoid covering the men with dust or mud (Field Service Regulations, vol. ii, Sec. 160).

Men unable to keep up till the next halt should be instructed to fall out and follow in rear of the column. Written permission to fall out should be given them by an officer (Infantry Training, vol. i, Sec. 129 (2) xiii).

In order to prevent gaps, any dismounted men accompanying transport will march in rear of and close up to the vehicles. Strict march discipline must be insisted on at all times.

No one other than the driver and brakesman of vehicles provided with a back brake is to ride on any cart, or wagon, or to place his arms and equipment on them without a written order from an officer (Field Service Regulations, vol. ii, Sec. 159 (5)).

Only one man beside the driver will be allowed to ride on transport vehicles. He will dismount when going up a steep hill or over rough ground and will operate the back brake when necessary.

In special cases men may, when in possession of a written order, ride or place their arms and equipment in empty wagons (Infantry Training, vol. i. Sec. 130, amended A.O. 202 of 1925).

No non-commissioned officer or man is to ride on a water-cart (Aldershot Command Standing Orders, 167).

On the line of march, or at manœuvres, the medical officer is responsible for the discipline of the men taken into the ambulance wagons under his command [1] (King's Regulations, para. 1430).

Officers in medical charge of troops at manœuvres or on the line of march will be mounted (Regulations A.M.S. para. 468).

When a medical officer is temporarily attached to a mounted unit for duty on the line of march the Commanding Officer is to provide him with a horse (King's Regulations, para. 1049).

Halts.

A short halt to adjust equipment and putties should be ordered soon after the column has started, in the case of both mounted and dismounted troops.

Halts should take place at regular intervals, and all ranks should know how often they may expect them and their duration.

Normally these halts will be from ten minutes before each clock hour until the clock hour, irrespective of the hour of the start or the nearness of the end of the march.

On the halt being signalled everyone will at once halt or fall out on the same side of the road as that on which they are marching.

Infantry, and men of other dismounted units, will take off their equipment during each clock hour halt and put it on again one minute before starting. They should be made to lie down during halts and if possible raise their feet so as to relieve them of pressure and allow the blood to circulate.

Every man in a four will change places after each ten-minutes' halt.

The notifications of these arrangements is a matter of routine and should be included in Standing Orders (Field Service Regulations, vol. ii, Sec. 156; Field Service Pocket Book, Sec. 6, para. 13; Infantry Training, vol. i, Sec. 129).

---

[1] The necessity for a medical officer to accompany troops when moving by march route is determined by Command Headquarters.

A long halt of one hour should be made during marches of fifteen miles or over, if possible in the middle of the march, where men can be fed if circumstances permit.

It is considered inadvisable to let men have a large meal until the march for the day is over.

During long halts for mid-day meals, etc., and when necessary during other halts, arrangements will be made for digging latrines.

These will be filled in (and marked) before the march is resumed. Paper, etc., will not be left lying about after halts (Infantry Training, vol. i, Sec. 132).

With halts of any length the most important sanitary question is the need of sanitary police to control and prevent the casual fouling of the vicinity of the halting places by men who retire to ease themselves.

Areas should be allotted to which the men may resort, and piquets or sanitary police placed over them to see that the men cover up all excretal matter deposited there.

Strict discipline is needed at all halting places to prevent wholesale fouling of wayside areas.

Unit standing orders must include instructions regarding sanitation on the line of march (Field Service Regulations, vol. ii, Sec. 156).

March graphics are described in Field Service Regulations, vol. i, Appendix 1. Paragraphs 6 and 13 of Section 2 refer to short and long halts respectively.

If units have to march to the area of concentration from the points of detrainment, the latter should be so arranged that the lines of march do not cross one another.

Marches should be comparatively short if troops have not been hardened (Field Service Regulations, vol. ii, Sec. 20 (6)).

Hawkers will not be permitted to accompany the troops (Training and Manœuvre Regulations, Sec. 73, para. 4).

Forced Marches.

Infantry should rarely be called upon to exceed the regulation rate of marching; such efforts usually fail in their object by exhausting the men.

A forced march depends rather on the number of hours during which the troops are marching without long halts, than on the pace of marching. If troops are called upon to make a special effort, they should be made to understand that it is for a specific object. Forced marching should be resorted to only when the expenditure of fighting power thereby entailed is justified by the object to be gained.

If distances are lost on the march, stepping out, doubling or trotting to regain them is forbidden, except by the order of the commander of the unit.

Distance lost will be picked up gradually or word sent to the head of

the column to march slower (Field Service Regulations, vol. ii, Sec. 152, paras. 4 and 6).

The duties of the movement section of the Q.M.G.'s staff include special arrangements needed to secure the health and comfort of personnel during long distance movements (Field Service Regulations, vol. i, Sec. 35 (4)).

Cavalry, if proper care is taken, may occasionally make a forced march of from forty to fifty miles without serious detriment to the efficiency of the horses and men, but marches of such length should not be undertaken without urgent reasons (Cavalry Training, vol. i, Sec. 237).

It has been found that in hot climates distances can be covered with the greatest ease to the troops by marching as soon as it is light and continuing up to midday with the usual short halts.

Heat stroke may develop owing to adverse conditions in hot climates; heavy or tight clothing preventing the evaporation of sweat, and occasionally lack of drinking water hindering free perspiration.

A soldier in marching order may lose, by perspiration alone, nearly a quart of water during a march of eight miles, even in a temperate climate (Army Manual of Sanitation, para. 21).

During hot weather every opportunity should be offered troops on the march to secure increased evaporation from the skin by opening or removing jackets and rolling up the sleeves.

Some care needs to be exercised to prevent men getting chilled at the halts if they have been perspiring freely and there is any breeze blowing.

In tropical climates sanitary precautions are of the greatest importance. Time must be allowed for the preparation of the necessary arrangements (Field Service Regulations, vol. ii, Secs. 136 and 144).

Marching in frost and snow. The most efficacious precaution against the effects of cold is an increased issue of rations; during halts the men should not be allowed to sit down or fall asleep. It is best not to make long halts. In the cavalry men should dismount from time to time.

To preserve the feet and limbs from frostbite :—

(*a*) Keep the feet clean, as dirty feet are more likely to perspire and are consequently more affected by cold.

(*b*) Wash the feet with soap and then smear them over with some greasy substance such as whale oil, vaseline, unsalted grease, kerosine, &c.

(*c*) Wear stout roomy boots and woollen foot cloths or stockings, or the feet may be wrapped in a double set of linen foot cloths, the under pair being greased.

To protect the hands and face, smear them with one of the greasy substances referred to above, wear mits or woollen gloves and ear flaps.

Men should be instructed, that in the event of frost-bite the part

affected should on no account be warmed at a fire, but should be well rubbed to re-establish the circulation.

To prevent snow blindness wear coloured glasses, failing these a mask with very small holes for the eyes gives fair protection. Greasing and covering with powdered charcoal the cheeks and sides of the nose also relieves the eyes (Field Service Pocket Book, Chapters II and VII).

Arrangements at the End of the March.

Unless some method is laid down so that everyone knows what to do, unnecessary checks and halts occur during the last hour on the march, much time is wasted and tired men are kept longer on the road than is necessary.

Commanders of units must be told immediately on arrival what special sanitary measures they will be required to take. Conservancy arrangements and matters of a similar nature will be explained to the men before they are dismissed (Field Service Regulations, vol. ii, Secs. 144 and 172).

When troops are encamped on the line of march for only one or two nights, straw will not be issued to them. Should, however, the state of the ground render it necessary, in the opinion of the senior medical officer, that straw should be issued, a quantity not exceeding the ordinary allowance for a first issue may be issued by the order of the officer commanding the troops, on the certificate of the senior medical officer that it is required for the health of the troops (Allowance Regulations, para 692).

Men's feet will be inspected by platoon commanders immediately after every march (Infantry Training, vol. i, Sec. 129 (xiv.)).

A suggested routine for the care of feet at the end of the march is given in Appendix III, Army Manual of Sanitation :—

(1) Remove boots, dry, dubbin.

(2) Wash and dry socks, rub them until soft, darn, but leave no ridges.

(3) Wash feet in cold water, rub with spirit, or alum solution, treat blisters, abrasions, etc., dust with foot powder.

(4) Put on clean socks and shoes.

N.B.—A useful foot powder is :—

Salicylic acid	3 parts
Boric acid	10 ,,
Talc.	87 ,,

Men require as much rest as possible. Parades should not be ordered earlier than absolutely necessary before a movement.

EPIDEMIC ENCEPHALITIS.

By Major ROBERT PRIEST, M.B., M.R.C.P.
Royal Army Medical Corps.

As far as I recollect, very little concerning this particular disease has appeared in the Journal of the Royal Army Medical Corps and possibly the reporting of these three selected and illustrative cases from British-soldier patients in India may help other officers, and may call to mind that no longer is encephalitis lethargica (popularly known as "sleepy sickness") necessarily characterized by a state of intense sleepiness and torpor, as it was when it made its reappearance amongst us during the latter part of 1918, but that the disease, as it now occurs, may present many varieties of clinical manifestations in the acute stage and that sequelæ exhibiting equally multifarious symptoms and clinical signs may make their appearance after a period from ten to twelve months or even as late as seven years after the original attack, which may have been either mild or severe in type.

So protean are the manifestations of epidemic encephalitis that I have collected and append hereto a list of other conditions which it may simulate very closely. When symptoms resembling paralysis agitans arise in a young patient, the importance of the previous history becomes paramount, and, if this is accurately ascertained, the clinical picture of the Parkinsonian syndrome becomes complete.

Case I.

This case exhibited lethargy, followed after an interval of one year by a not infrequent sequela known as the Parkinsonian syndrome.

Pte. M. B., aged 20, was sent to Naini Tal as "N.Y.D." in the late spring of 1924.

The following history was ascertained from the patient and corroborated by others of his unit.

He arrived in India during the trooping season of 1922-23. He had been quite well until January, 1923, but during the march with his regiment from Meerut to Dehra Dun, he became more sleepy day by day and his comrades dragged him along to prevent him falling out, there being a keen effort on the part of the men of his company to maintain a low sick-rate while on the march.

After arrival at Dehra Dun he complained of stiffness in the legs, acute pain in the left side just below his ribs. He then noticed that his eyes began to discharge "a thick matter and that his eyes were gummed up in the mornings." The sleepiness lasted for three weeks or more, but in spite of this he carried on his duties. He says he could not read because

things seemed double. Subsequently the regiment set out by road from Dehra Dun to Chakrata and he had to hang on to a mule-cart because of the weakness of his legs, also a sharp pain in the groin which made him limp. In Chakrata he got better without any treatment, and was employed on light duty as a bungalow orderly. He proceeded to Lucknow by train in January, 1924, and about March, 1924, he began to notice shakiness in his arms which he could not control. He said "the Corporal used to chase me for being so slow and my comrades used to help clean my kit and help me to dress."

At this time he found some difficulty in speaking, but this passed off in a few days.

His vision became impaired, as shown by his being a first-class shot in 1922, and a third-class shot in 1923. He had had no trouble with the sphincters.

Considering this history, apart from the sleepiness, other points should make one think of epidemic encephalitis, viz., the sharp pains in the hypochondrium and in the groin, the conjunctivitis, double vision, slowness of action, weakness and the tremors of the arms.

On examination, he had a rigid, slightly stooping attitude, a fixed facial expression, slight tendency to drawl, and occasional involuntary and rapid nystagmus. The eyelids were reddened and covered with desiccated exudation. He appeared to shiver as he sat and the tremors became more coarse and exaggerated on movement, while the left hand showed a pill-rolling complex. Gait was stiff and slow. The following points were noted on examination of the cranial nerves: Pupils reacted to light, but the reaction to accommodation was very slow and sluggish, lateral nystagmus present, all facial muscles were weak but more marked on the left side. Soft palate anæsthetic and on movement there was left-sided weakness. Tongue protruded to the left. All tactile sensations to light, touch, pin-prick, heat and cold, were normal. Passive sense of position normal.

There were fine tremors affecting the left side of the face and both arms, but more distinctly seen on the left than the right; tremors being exaggerated by voluntary movement and emotion. He could scarcely drink out of a cup owing to the exaggerated movements of the left arm, and the cup, when it reached the mouth, struck the teeth several times with considerable force and its contents were spilt. There was no wasting of any muscles or group of muscles, the arms felt rigid on manipulation, all reflexes were increased in both arms, but more so in the right than in the left. There was muscular weakness and some inco-ordination.

Flexor plantar reflexes present, no patellar reflex or ankle clonus, knee-jerks exaggerated, especially the left. Superficial abdominal reflexes increased. Lungs, heart and abdominal organs appeared healthy: he had perfect control of sphincters and there was no Rombergism.

Optic discs appeared normal and unaffected. Stiffness and rigidity subsequently appeared in the left sterno-mastoid muscle.

Urine, normal. Blood : Wassermann reaction negative on two occasions, total and differential leucocyte count within normal limits. Stools contained no parasitic ova. Apyrexia throughout.

There were certain mental and moral changes in this patient, for he was dull and apathetic and seemed to stare at a book and derive no benefit; practised masturbation when opportunity offered; subsequently committed purposeless thefts from comrades in hospital but made no attempt to conceal the object he had stolen.

He made no improvement in spite of rest, good nutritious diet and administration of hexamine. He was invalided to England.

I have heard since that this patient died from "sleepy sickness" during the summer of 1925.

Case II.

Preceded by an attack of "influenza" and followed by drowsiness, and six months later by the onset of the Parkinsonian sequela.

Sub-Conductor B., aged 39, gave a history that he had had an attack of "influenza" in Afghanistan in July, 1919, from which he made a good recovery. In the October of the same year he noticed that he commenced to see things "double," which passed off in a week or so. He said "his nerves had gone to pieces and that he felt irritable and very jumpy." Two months later he began to be very drowsy and slept twenty-two out of twenty-four hours with the greatest of ease. This gradually passed off and he was able to carry on his duties until July, 1925, when he noticed that he became slow in his work, slow in his bodily movements, and finally reached the state in which he was when I examined him on December 1, 1925.

He had a fixed and expressionless countenance, stared straight in front and seemed not to observe things going on round him. His gait was stiff, but not festinant, body being kept erect, but he kept a straight course. Very apathetic, he would keep his arms in any position I chose to leave them.

There was marked facial weakness, especially on the left side, the orbicularis muscles of the eyes were weak. Tongue was protruded in mid-line, but showed medium and regular rhythmic anterior-posterior tremors. The left palate moved sluggishly. The pupils were almost fixed and reacted very slowly to both light and accommodation. Eye movements good and full, and there was no nystagmus. Abdominal reflexes absent, cremasteric reflex present, but sluggish. Knee-jerks present and equal. No sensory loss detected. Arms and legs extremely rigid on passive movement; muscular power was feeble, more marked on left side. The left grip was weaker than the right. No wasting of any single muscle or muscle-group.

On voluntary movement, tremors of the left hand became evident when attempting to button his coat, which act was completed after much difficulty. There was no ataxia, for he could mount a bicycle and ride off, and was

able to avoid traffic in the road with ease. There was no Rombergism. Sphincters controllable.

Cases like this have been mistaken for paralysis agitans, but differ in the ætiology and in the past history.

He was invalided to the United Kingdom.

Case III.

Case III illustrating the subacute type, passing into delirium and mania and terminating fatally.

Private C., aged 22, was admitted to the British Station Hospital, Meerut, on September 19, 1925, on account of dull and apathetic mental condition and because he had behaved absurdly, in that he had purchased boots for 16 rupees and had sold them for 1 anna.

Temperature was 100·2° F., and a blood-smear was found to contain benign tertian rings. Tongue was thickly coated and his mouth and breath were very offensive. On September 25 it was noticed that his mental state was dull during the day, but during the night he became excited, restless and talkative, but not delirious. The next day he was very drowsy, pupils were normal, reacted to light and accommodation, tongue very foul, complained of no pain.

On September 27 he was drowsy, he could only answer the simplest questions. Pupils were contracted and showed no light or accommodation reflex. All other cranial nerves appeared normal. Kernig's sign present, but not marked. Right knee-jerk increased, left very sluggish. No ankle or patellar clonus. Sensation not impaired. Urine normal. Only a few drops of cerebro-spinal fluid were obtained by lumbar puncture. Examination of the optic discs after atropinization showed them to be normal and there were no retinal changes.

Ophthalmic Report.—On September 27 both pupils small, pupil reaction sluggish for direct and consensual reflex. Accommodation reflex present and normal in both eyes. Movements full and unaffected. Convergence good. Vision not affected, he can read a book held close to his eyes. On September 28 examination after atropinization showed no change in muscle movement; tension normal; both fundi normal; no changes in eye of any diagnostic importance.

For the next three days he seemed to improve and become brighter and clearer mentally, and was very much less restless at night. I was called to see the patient in consultation on September 29, during his improved condition, when he exhibited the following physical signs :—

He was sensible and answered questions slowly but correctly, speech sounded somewhat indistinct. Tongue covered with a thick fur, breath very offensive, saliva viscid and milky in appearance.

Ocular movements were full, left-sided facial weakness, loss of palate reflex on left side; uvula insensitive and stroking of palate or fauces

caused no retching. Tongue protruded in mid-line. Pupil reflexes could not be tested as the effect of atropine was still present. Right pronator reflex greater than left, epigastric reflexes present but sluggish; right cremasteric reflex absent; flexor plantar reflex present on right side, while the left was indeterminate. No ankle or patellar clonus. Sensations normal. There had been incontinence, but the sphincters were now normal. From his behaviour, moderate fever, foul tongue, drowsiness, vomiting, left facial weakness, changing character of reflexes, nocturnal restlessness and incontinence, I considered the case to be one of epidemic encephalitis.

The improvement was short-lived, for on the evening of the 30th he became restless and noisy, his mental state became confused, the left facial weakness became more marked, active restlessness at night was evidenced by his trying to crawl round his bed. Later, right external strabismus was noticed, the pupils became small and inactive. On October 7 he became maniacal and required constant restraint. He exhibited contortions, was delirious, talked constantly, appeared to see people about him.

Coma supervened and he succumbed on the evening of October 7, twenty days after admission to hospital.

The temperature was irregular throughout and pulse-rate was low in proportion. Constipation was a marked feature.

Pathological Report.—(1) Naked-Eye Appearances.—The brain shows intense congestion of all the blood-vessels with some flattening of the convolutions. The cut surface shows the same congested appearance, and in addition some very small dark points, possibly hæmorrhages. The spinal cord shows congestion also, but to a milder degree.

(2) Microscopic Appearances.—The sections of the brain show invasion of tissues by small round cells and plasma cells. These are specially well seen round the larger blood-vessels where they form a deep staining mass of cells in and around the walls of the vessels. Round the capillaries this invasion is not so well seen having spread more diffusely into the surrounding tissues. The sections of the spinal cord show the same condition in a milder degree. In my opinion, these appearances are very striking and are typical of those caused by an encephalitis such as encephalitis lethargica. The post-mortem findings confirm the clinical diagnosis. It is regretted that no cerebro-spinal fluid was obtainable, otherwise it would have been interesting to determine the sugar content of such fluid, which is said by some authorities to be increased in this condition.

Epidemic encephalitis may simulate :—

Tuberculous meningitis, intracranial tumour, diffuse sarcomatosis, miliary tuberculosis, cerebral syphilis, cerebral abscess, basilar arterial thrombosis, meningeal hæmorrhage, suppurative ependymitis; poisoning by luminal, illicit whisky-drinking, veronal, chloral and morphine poisoning; myoclonus of uræmia, cerebral malaria and hysteria, acute painful spasm of the abdominal muscles leading to operative interference for

supposed renal calculus, or an "acute abdomen." Sydenham's chorea, disseminated sclerosis; Landry's paralysis; myasthenia gravis; the early erythema in some cases of scarlet fever (Hall), poliomyelitis, botulism, status epilepticus, uræmia (Osler and McCrae), influenza, and the cerebral form of infective endocarditis. The Parkinsonian sequela of epidemic encephalitis has been confused with paralysis agitans; and it should be borne in mind that confusional insanity, violent mania, melancholia, delirious mania, suicidal and homicidal tendencies may have been preceded by a mild attack of this disease.

In conclusion, with regard to Case III, my thanks are due to Major A. Hood, R.A.M.C., for the pathological report, to Captain Kumar, I.M.S., for the ophthalmic examination, to Captain Creagh, R.A.M.C., for the use of the notes of the case. I should also like to express my thanks to the Director of Medical Services in India for permission to publish this communication.

MEDICAL SUPPLIES FORTY YEARS AGO.

By J. BURDEN BARNES, O.B.E.

Late Inspector of Medical Supplies, War Office.

A PERIOD of forty years brings about changes in most things which concern us in this world, and when those changes are in the direction of progress and improvement, it is a matter of satisfaction as well as of interest. Particulars of the conditions obtaining in military hospitals in connexion with medical supplies forty years ago compared with those in operation at the present time are no exception to the rule, and it is thought some reference to them may prove of interest to readers of the ROYAL ARMY MEDICAL CORPS JOURNAL, and may show that real progress has been made since that time. Medical supplies, or "medical equipment," which is now the correct term, include surgical instruments, appliances, drugs, chemicals, medical materials, as well as sera, vaccines, surgical dressings, operation-room furniture, microscopes and X-ray, chemical, bacteriological and pathological apparatus, optical goods, sterilizers, as well as similar items, specially designed for use in active operations in the field.

One curious feature of the condition of medical supplies in 1885 was that in an appendix to the Regulations for the Medical Department of the Army of that period is to be found a fixed scale of medicines and medical materials calculated for the use of a force consisting of 1,000 troops (inclusive of women and children) for a period of six months, with suitable proportions for a smaller or larger number of troops. Imagine to-day a fixed scale based upon the number of troops, irrespective of the number of occupied beds in a military hospital, the incidence of sickness or the possibility of the outbreak of an epidemic; moreover, intermediate demands were rigidly discouraged and extra articles were only given under exceptional circumstances. Presumably, the authorities in those days thought that the troops required rations of drugs as well as rations of food, and one has a shrewd suspicion that Army surgeons often preferred to supplement, at their own expense, the modest supply of drugs allowed rather than to incur the wrath of the medical authorities at headquarters. It is comforting to learn that two years later the scale was abolished and medical supplies were allowed to be issued in such quantities as the principal medical officer approved. If the scale is examined, some curious light is thrown upon a section of the normal professional work of an Army surgeon in those days. With three pounds of carbolic acid, twelve ounces of ether and eight ounces of chloroform for 1,000 troops (inclusive of women and children) a surgeon could not perform many major operations at a time when Lister's steam carbolic spray was the orthodox procedure, or, if he did, he would have to rely upon some other form of antiseptic for minor

operations and the treatment of wounds and sores. The allowance of surgical dressings included ten pounds of fine lint, sixty pounds of second lint, sixty pounds of surgeon's tow, two yards of bleached linen sheeting, three yards of calico, three old linen sheets, twelve small surgeons' sponges, thirty calico bandages and two pounds of cotton wool; but no loose woven bandages or cotton gauze which are now considered to be so essential for wound dressing. In the light of modern methods of sterilization of both skin and dressings and the habit of burning all used dressing materials, these quantities, especially those of bandages and cotton wool, will appear to the up-to-date medical officer to be totally inadequate, but it must be remembered that surgeons' sponges and calico bandages, however foul, were expected to be washed and used over and over again in these pre-aseptic days. An operation table—a wooden one—was provided at a station hospital where there were 1,000 troops, but it is obvious that major operations were rarely undertaken in these places, because little provision was made for them except that a set of capital instruments, a case of eye instruments, an ether inhaler, an apparatus for bloodless operations and a few scalpels and other items could be borrowed, when required, from the loan equipment held on charge at the headquarters of each district. In the smaller hospitals major operations were not expected to be performed and no provision was made for them.

Although antiseptic surgery was practised to some extent in this country at this period, when Lister's steam carbolic spray was passing into desuetude, the days of aseptic surgery, which resulted in the enormous increase in operations which could be safely and successfully performed, had not arrived. One is astonished at the liberal scale of spermaceti ointment (16 pounds) and linseed meal (2½ hundredweights), while the scale of glycerine (3 pounds), vaseline (2 pounds), and corrosive sublimate (1 ounce), appears to be small compared with modern requirements. That conservative dental treatment was not practised in those days is obvious from the fact that beyond a few primitive hand-filling instruments with gold leaf, amalgam and temporary stopping, no outfit was provided for this purpose. Extractions were, of course, made by the dispenser and not by the surgeon, and the modern dental surgeon will be shocked to learn that the barbarous tooth key with three claws was contained in both the tooth case and the tooth pouch of forceps of 1885. One wonders why a case of cupping instruments was retained in the scale so late as 1885, and it is to be hoped that it was duly dusted and polished up before the date of the annual inspection. There could not have been much prying into secrets with only one microscope of medium power available for use in each district. Venereal treatment was largely confined to the use of a pewter or glass syringe with sulphate of zinc injection and the administration of copaiba, buchu, liquor potassæ, and hyoscyamus. Sterilization of instruments and dressings was not practised in these happy times, hence the omission of sterilizers from the regulation scales.

Röntgen rays were not discovered till 1895, so it is not surprising that an apparatus for their production for the diagnosis, treatment and localization of foreign bodies is not included in the Army surgeon's armamentarium in 1885. Neither hygiene nor pathological laboratories were established in military hospitals at the period under notice, and diphtheria antitoxin treatment was not practised till 1894, and consequently one does not expect to find lists of equipment for these laboratories; and sera and vaccines are not mentioned. With an Army corps in the field were carried the following items: pharmacy wagons and surgery wagons, each containing what would now be considered an inadequate supply of surgical dressings in addition to drugs, surgical instruments and splints, field medical and surgical panniers, "reserve" medical and surgical panniers, "special surgical" panniers, surgical haversacks, surgical bags (for cavalry), field medical companions—the latter known as "hairy companions," because they were covered with untanned cow-hide with the hair outside—field fracture boxes, boxes of apparatus for fractures and dislocations, and medicine chests. The pharmacy and surgery wagons, and surgical bags (for cavalry) have long since been abandoned, and the other items have been remodelled and the contents so altered to meet modern requirements that they are almost unrecognizable.

The base and advanced depots of medical stores furnished the bulk of the medical supplies in the field, then, as now, packed in handy cases—the well-known "war case" marked with a red cross and measuring about three cubic feet. When medical supplies provided for sick and wounded soldiers to-day are considered, it will be found that great advances have been made which are consistent with the increase of medical and surgical knowledge. Modern science has revealed many secrets which have been successfully applied for the prevention of disease and the alleviation of suffering. The medical officer is a more highly-trained scientific man than his predecessor of forty years ago, and he expects to find provided for him the material required for the up-to-date methods of treatment. He has at his command the very latest instruments and materials for operative treatment or pathological diagnosis, and can call to his aid in difficult cases the highest expert opinions of the consulting surgeon and the consulting physician of the British Army, or, if necessary, of the honorary civilian consulting staff appointed to the Queen Alexandra Military Hospital. Specialists in hygiene, pathology, ear, nose and throat, syphilology, X-ray, etc., are to be found in the Royal Army Medical Corps, and their opinion is sought in deciding what apparatus is required for the use of the expert. Military hospitals to-day are equipped on a scale which was never dreamed of forty years ago when X-rays were unknown, pathological bacteriology was in its infancy, serum treatment had not been discovered and artificial teeth and spectacles were not provided at Government expense. The soldier to-day may be assured that in health he is protected by the most up-to-date methods of hygiene in barracks, camps, or on board ships, and that

when he falls sick he has not only the best medical advice which is obtainable but also the latest and most up-to-date materials for carrying out that advice are available. The taxpayer, too, who rightly expects that the money he contributes to the State shall not be wasted, may rest assured that the medical attendance which is given to his country's defenders is, at least, equal to that obtainable in civil life and that the materials necessary for proper treatment are adequate, of the finest quality and obtained on the best and cheapest terms. The British taxpayer, who compares the annual cost of providing medical supplies to the Army at home and abroad to-day with the cost forty years ago, must bear in mind that the increased cost of the raw materials and labour has at least doubled the value of the materials required for the treatment of the sick, and increased knowledge has rendered it imperative that the proper appliances which this increased knowledge calls for—and they are in many cases expensive items—shall be provided for the soldier. To give examples of the cost of some items which were not included in the 1885 scales: an X-ray outfit, such as is provided to the larger hospitals, costs about £1,600; a set of surgical instruments for one of the larger hospitals, about £1,400; special instruments for the ear, nose, throat and eye departments of such a hospital, £270; an aseptic operation table and other special articles of furniture for an operating room, £300; while the apparatus and reagents for a pathological laboratory cost £250; and dental appliances for a dental surgeon about £90. It is not surprising, taking these facts into consideration, that the annual cost of medical supplies has risen from £29,500 in 1885 to £67,600 at the present time. This comparatively moderate increase in the expense of providing the best, the most up-to-date and the most efficient medical service for the soldier, his wife and family, shows that the interests of the taxpayer are being carefully watched and that he is getting adequate value for his money.

A CORRESPONDENCE CIRCLE.

XVI.

A NOTE ON LECTURING.

By Major M. B. H. RITCHIE, D.S.O.
Royal Army Medical Corps.

One day you may be directed to give a lecture to the officers of your garrison, probably on medical organization in war, hygiene, or similar subject. Do not attempt to shuffle out of it. Equally, do not take the matter too seriously. Assuming that you have never heard the sound of your own voice uplifted in a lecture room, and have no natural tendency towards oratory, there is no reason why you should not give a good, practical lecture that will be much appreciated. It appears to be largely a matter of assurance coupled with practice.

When preparing the lecture, put yourself in the frame of mind of the average man who finds himself a member of the audience at a garrison lecture. He has probably been directed to attend, he is prepared to be bored, and he is going to sit as far away from you as he can. So set about defeating him. Try to find the easiest way of thrilling him; if naturally humorous, give this divine gift full play, but if not so endowed, for goodness sake do not try to be funny. There is the alternative method of being serious, that may succeed equally well; in other words, be natural in whatever way nature has made you.

As regards reading it from manuscript or type, realize from the start that this is out of the question. Write it out carefully by all means, get it into shape, learn it up and rewrite bits of it, but understand from the first that this is merely a guide and a standby in case of misfire. Rely on notes, typed preferably in capitals with reasonable intervals between them. Abhor the Army method of typing without a space between the lines—it is a relic of war economy that no editor will tolerate. It is a good plan to have a *précis* of the lecture distributed among the audience; with a copy of this before one, there is little chance of getting side-tracked on secondary topics.

The duration of an Army lecture should be three-quarters of an hour, but a lecture to any scientific body usually takes up the full hour. Having got it together and its length adjusted, it must be "vetted" by your chief—in some cases the officer who presides may want to go over it first with you. This is an excellent plan, and he will give you useful advice and criticism. About delivery and other cognate matters—speak out clearly and distinctly; get your shoulders back and your head up; aim so that your words carry a few feet above the heads of the first few benches and

come down on the ears of the back rows—where your friends probably are, as in Army lectures the front rows with the best chairs are filled by those more exalted in rank. Words have a short range and the trajectory is high. Look around the lecture room before the ordeal begins and see that your desk is all right. It is a good plan to have a table or some solid piece of furniture behind you ; you can then place your hands upon it behind your back and so keep your shoulders back and chest opened out. In front of you is a music stand, or preferably a more solid desk, on which your notes rest. Until you become a Parliamentary candidate, avoid a platform with nothing in front of you and a flimsy chair behind; to score hits in these circumstances entails shoulder and arm work that is out of place in a simple military lecture. Soldiers are never politicians.

Talk slowly, with occasional pauses, as the audience can follow much more easily. He who begins to gabble is done. Ordinary speaking is too fast; lecturing is much slower. Listening to a good, straightforward sermon will act as a useful guide. Think of an engine that is ticking over with the spark retarded. At the same time modulate your voice now and again, and emphasize all salient points. For one who has had no experience of lecturing, there are the lectures given to the men undergoing instruction for nursing orderly, etc. ; take these lectures, but do not sit down at them ; get into the habit of talking when standing up. This is a point worth remembering.

Commit to memory the opening and concluding portions of the lecture. With a good beginning, and a good ending, half the battle is already gained. Bear in mind that our Army spoken language differs from what we write, if we converse as we write the result is pedantic; if we write as we speak no editor will accept it. (I used to find in France that it was easy to send concise directions over the 'phone, and extremely difficult to put them into written Army English as an order afterwards.) Thus, if a lecture is read out it never sounds natural—it is a differently constructed language and out of focus. A pitfall to avoid is turning to the diagrams behind one ; there is the danger of talking to the blackboard and the audience getting only the rebound. This is an important point; the lecturer must keep his head to the front all the time, even when referring to diagrams ; for this reason it is often better to have the desk at one side and so take the audience in flank.

Now to the substance of the lecture, presuming that it is about R.A.M.C. organization in the field. Begin by stating that it is a subject which concerns the regimental officer, as he may be asked questions on it in examinations, while the aspirant for the Staff College may gather in a few extra marks from a knowledge of it.

Then strike deep into the lecture. Take the division first, go over the medical units and give the listeners a clear impression of the organization, composition, equipment and transport of a field ambulance. Try to give a mental picture of it on the march ; this avoids any confusion of ideas

between it and a motor ambulance. Then run over the sanitary section, and proceed to describe the corps and army units; from this, tackle those of the lines of communication. This does not take long, and the next item is to deal with the functions of units, tracing the wounded man on his travels from the battlefield to England; pay most attention, however, to evacuation in the forward area, as junior officers are not concerned with much behind the division. All the information required can be obtained from War Establishments, Field Service Regulations, and R.A.M.C. Training. This completes the organization part.

Then describe the difficulties that we have to contend with after an action. No army takes the field until its supplies of ammunition and food have been assured; you tell them this nicely, and then hammer it in that the casualties cannot be foretold in the same manner; transport is limited and you can only clear up to a fixed number in twenty-four hours unless assistance is forthcoming; the medical service can never decline to tackle a job on account of having had no warning, as others may. R.A.S.C. and R.A.O.C. elements in the audience will prick their ears if you point out that medical breakdowns are usually due to lack of transport or lack of accommodation, such as tentage, the control of these not being in medical hands. Breakdowns are not from the things in our own hands, such as personnel and medical stores.

If this line of advance is developed, a good deal of ground will soon be covered, and the attention of the listeners held, as it touches upon problems that interest them. One is discussing their work, seen from our angle. One or two home truths can be driven in, but it must be done nicely; a gentle dig at the staff is almost expected.

One should explain to an audience that our present organization is a "taking-off" one that may have to be modified as a campaign develops. The nature of the fighting, types of casualties, methods of treatment and other influences may lead to early modification. In France, surgical policy, as with excision of wounds, modified the medical organization; increased accommodation was required at the C.C.S.'s and more surgeons were wanted in the forward area. Also, there is the obvious fact that a system designed for the treatment of wounds is of little use if the bulk of the casualties are caused by chemical weapons. From this one can proceed to discuss the medical aspects of chemical warfare and the arrangements for treating casualties; speak always of chemical warfare.

This brings the lecturer well into the last lap. If he is an optimist, and uses his imagination, he can dilate on the important *rôle* that the medical service is destined to play; the increasing scope of the doctor in war can be worked up from data in the medical history of the war—dirt diseases, for example. *We are the nursemaids of the Army.* Ponder over this analogy, there is some truth in it. Mechanicalization, aviation and chemical warfare should be viewed in their medical aspects; we must know what the brains of an army are thinking about in order that we can

attempt to visualize our lines of development, which will have an influence on the paramount problem of achieving victory in the field. Drive it in well that our Service is intimately linked up with this problem.

Speaking to brother officers, with no reporters, much can be said that cannot appear in print. They expect a lecturer to be an enthusiast, to discuss the subject as it concerns the Army, and to talk straight. One must be dogmatic in the organization part; later one may turn intriguing, and at the end, speculative. All the way through be forceful, decisive; display no bitterness or bigotry. Marshal the facts, lay the points out clearly, and ram them well home. Show that you have a thorough knowledge of the subject, speak with frankness and conviction, do not be too serious, and if things should happen to go wrong treat the matter in the light of a joke. Try to shake off any traces of nervousness after the first five minutes, do not feel browbeaten because there are more "high-ups" than subalterns; if this feeling should come, imagine that the audience is a class of nursing orderlies, before whom you are completely at ease. Remember that an audience of officers is always sympathetic and friendly, and does not exact a deep, abstruse study of the subject.

The regimental officer is constantly talking to his men, and our difficulty is that we do not get the same experience. We have many fluent speakers, but there may be others, like the writer, who have remained inarticulate all their service and feel that reticence and shyness should at last be mastered.

But there crops up the fact that each officer in his own station may be as representative of the Corps as any other member of it. In his own interests, as well as those of the Corps, he should have a working knowledge of lecturing. And it broadens a man's mental outlook. Perhaps these few notes from one who is attempting the difficult task may stimulate interest in the subject.

Editorial.

THE MEDICAL SERVICES OF THE AMERICAN EXPEDITIONARY FORCE IN THE GREAT WAR.[1]

THE United States Official Medical History of the Great War is being published in fifteen bulky volumes weighing some nine pounds each; and as some are in two parts, the actual number will exceed fifteen. When the history is completed it will thus comprise, in a formidable set of library books, a comprehensive record of the American medical services from the time the United States entered the war. At present only five or six of the volumes have been published. Part I of vol. xv, on army anthropology, was the first to appear, some five years ago. Vol. i of the series dates from the year 1923 and deals with the administration work and organization of the Surgeon-General's Office in Washington. We have now received vol. viii. It deals with medical services in field operations. To British readers it will probably prove the most interesting of the series, and to officers of the Royal Army Medical Corps the most important, as it emphasizes many of the lessons which medical services have learnt in the war, and some of which, we may say without presumption, were impressed on the United States medical authorities by Sir John Goodwin when he was with the British Mission to America in 1917. It may be of benefit, therefore, to our readers to place before them a few of the more important points and experiences set forth in this excellently prepared and well-documented volume.

The general arrangement is that which had been adopted in preparing the volumes of the "General History of the British Medical Services" completed some three years ago. As originally written, the American volume recorded the history of the field operations from the unit, or as it is termed in America the organization, point of view, each military operation being described separately and chronologically only in so far as individual units, such as the division, were concerned. It was afterwards, however, considered advisable to re-write the entire volume so as to consider each military operation as a whole and disregard those portions of the histories of units not required for the purpose. In accordance with this conception the history of the medical services during the field operations in which United States troops took part is set forth in seven sections, each containing one or more chapters. The first section, in eight chapters, including one of three pages only on veterinary services, corresponds in

[1] The Medical Department of the United States in the World War. Vol. viii. "Field Operations." Washington: Government Printing Office. 1925. Pp. 1097, with 23 Tables, 4 Charts, 55 Plates and 99 Figures. Price 3 dollars.

detail with the first seven chapters of vol. ii of the "British General History of the Medical Services," being a summarized account of the work, functions and experiences of the different classes of medical units and administrative medical services in the field. A quarter of the volume is devoted to this section, and it is from it that the more important lessons may be learnt and compared with the British experiences. The second section, of five chapters, describes the operations of American divisions with the French armies south of the Somme and in the Aisne sector at the time of the German offensive of 1918, and during the Aisne-Marne and Oise-Marne operations at the commencement of the advance to victory. The third section, of six chapters, deals with the independent operations of the U.S.A. First Army, organized in August, 1918, in the St. Mihiel sector. The fourth section continues, in fifteen chapters, the history of the First Army in its operations during the advance in the Meuse-Argonne area. Section V, of two chapters, deals with contemporaneous operations of certain American divisions with French armies in Champagne and Flanders; section VI, one chapter, with the work of the U.S.A. Second Corps which formed part of the British second and fourth armies in 1918; and the last section, of four chapters, with American military activities in Germany, Italy, North Russia and Siberia. The volume contains 1,097 pages, and the last 120 of these form an appendix containing brief histories of each combatant division, extracts from U.S.A. field service regulations and the manual of the Medical Department, and tables of war establishments of divisions, corps and armies and of each unit of which they are composed, together with an index.

We may now turn to the more important points in the history of the United States Medical Services during the comparatively short time they took part in field operations. First, as regards personnel for medical services, we have been told in vol. i of the history that at the time of the Armistice there were in military service 30,591 of the U.S.A. medical profession, 4,620 dental officers, 2,234 veterinary officers, 21,480 members of the "Army Nurse Corps," and 281,341 enlisted men of the medical department, but of these vast resources only 5,198 officers, 2,529 nurses and 30,574 other ranks had joined the Expeditionary Force in France by June 1, 1918, figures which expanded, however, to 17,487 officers, 8,951 nurses and 137,403 other ranks, by the end of November. In June, 1917, the Surgeon-General in Washington estimated his requirements for medical services at fourteen per cent of the troops, but this percentage, a high one, was apparently not reached, and the Surgeon-General in the field reported that "the Armistice was the only thing that saved us from a disastrous situation resulting from shortage of personnel."

The medical personnel of the British Expeditionary Forces at the time of the Armistice numbered only 144,514 officers and other ranks; and it is not easy to understand the shortage of medical personnel with the American Expeditionary Force when one compares our numbers with theirs and

remembers how brief was their period of field service and how comparatively few their casualties. But some light is thrown on this, by the very liberal use of specialism in the field. We find orthopædists, psychologists, urologists, shock experts, radiologists, ear, eye, nose and throat specialists, tuberculosis specialists, gas experts, bacteriologists and pathologists, in addition to surgical and other teams, allotted at times for work in field medical units. This was, no doubt, due to the extensive development of specialism in civil practice in America. But multiplication of specialism and the establishment of specialist hospitals in the field are stated merely to have increased the difficulties of evacuation and caused confusion, delays and waste of transport.

Since the armies of to-day must, in the event of war, draw a large proportion of their medical personnel from the civil profession, the lesson which we thus learn from the American experience should be constantly kept in mind. The British medical services were always hard put to it for personnel, but with a very much smaller establishment of officers and men, and a very much larger force in the field, engaged in constant battles for more than four years, they avoided the contemplation of disaster, chiefly by a more economical use of their resources, by developing specialism only as circumstances demanded, and never to the extent that obtained in the American Expeditionary Force, and by a personnel that turned their hand to anything required of them.

We do not forget, however, the welcome addition to our strength by the fine body of medical officers and other personnel from the United States of America, who served with our battalions and field medical units, and at our base hospitals in the last two years of the war. As an off-set to these, the American history records the welcome saving of U.S.A. medical personnel by the use of the whole of our medical organization and hospitals for the sick and wounded of the U.S.A. 2nd Corps.

Each division, the aggregate strength of which was 27,152, had a "sanitary train," consisting of four ambulance companies and four field hospitals, the former corresponding with the bearer divisions and ambulance transport, and the latter with the tent divisions of our field ambulances. The ambulance companies formed advanced dressing stations and were responsible for clearing the battalion and regimental aid posts and evacuating from the dressing stations to the field hospitals; but the mistake was made of making the battalion medical officers responsible for sending back information regarding their positions to the dressing stations, instead of making the latter maintain touch by runners. Until this was remedied liaison between the battalions and the divisional medical units failed. During the advance the British methods were adopted, and it is interesting to note that in open warfare the horse-drawn ambulance wagons proved more useful than the motor ambulance cars for service in the front.

The ideal disposition of the four field hospitals of the division was the "diamond" formation. The advanced point was a *triage*, or sorting out

field hospital, one lateral point was a hospital for non-transportable cases, the other a hospital for gassed cases, and the rear point a field hospital in reserve.

The Americans, however, did not find their field hospitals sufficiently mobile on the change from trench to open warfare, and commenced organizing mobile surgical units and mobile hospitals on the pattern of the French "*auto-chir*" (*automobile-chirurgicale*). The French *auto-chir*, as employed from 1915 onwards, was an advanced operating centre, carried on three lorries, with operating room, sterilizing and radiology requirements; it functioned in the neighbourhood of the field ambulance, not as the American history states, "habitually in conjunction with an evacuation hospital," but much further forward. Wounded, after being operated on, were placed in the hospital section of the field ambulance; but, in 1918, an addition was made to the *auto-chir*, in order to make it independent of the bed accommodation of the neighbouring medical unit. It thus became an advanced operating hospital, and, following these models, the Americans organized what they described as a "mobile hospital," carried on twenty three-ton lorries, with an establishment of 12 officers, 22 nursing sisters and 80 other ranks, and accommodation for 120 beds; and a smaller "mobile surgical unit," similar to the original French *auto-chir*, with a personnel of one officer and fourteen other ranks, and no bed accommodation. Twelve mobile hospitals were ready by the time of the Armistice, and a full description is given of the first of these, organized out of a base hospital in France, for 200 beds, with 64 officers, 50 nurses and 218 other ranks. The fact of its being originally a Red Cross Base Hospital may be the explanation of this large personnel for a mobile hospital of that size. Sixteen of the mobile surgical units were in service at the time of the Armistice, out of twenty ordered.

The U.S.A. evacuation hospitals, corresponding with our casualty clearing stations, were originally organized in the proportion of two per division with 432 beds each. In 1917 the accommodation was increased to 1,000 beds, but only thirty arrived in France for the forty-two divisions by the time of the Armistice, and of these only twenty-two were in the field when twenty-nine divisions were in the fighting line. The American policy was to concentrate on the severe wounds in these hospitals and not waste time on the slighter cases. The establishment was normally 34 officers and 237 other ranks, but at times the personnel was greatly augmented, for we read of No. 1 Evacuation Hospital having 97 officers, 92 nursing sisters, and 674 other ranks in September, 1918. In days of battle the British method was adopted of reinforcing the evacuation hospitals with surgical teams. Altogether 244 teams from base hospitals and 95 from other sources, each with a personnel of 2 surgeons, an anæsthetist, 2 nursing sisters and 2 orderlies, or a total personnel of 2,183, were organized. In addition to the surgical teams, thirty teams were organized for application of splints, and seventy-eight for resuscitation. It is stated that the U.S. medical services objected to large immobile evacuation hospitals and did

not agree with the policy of their allies in this respect; but as it required ninety to 120 lorries to move one of theirs, they do not appear to have been more mobile than the British casualty clearing station. In fact the necessity of mobility in casualty clearing stations was being constantly impressed upon us in France. The want of laundries was greatly felt by the evacuation hospitals, and the importance of organized field laundries for medical services is a point worth considering, although during the war we managed to overcome the difficulties by local arrangements. Another point, noted by the Americans in connexion with evacuation hospitals, was that a white cross on a black ground was more visible from the air than a red cross on a white ground. This is a point that should be considered in a revision of the Geneva Convention.

The American Expeditionary Force had no convalescent depots organized by the end of the war, but the want of them was much felt. Mobile laboratories were not organized until 1918, the first two being obtained from England.

In connexion with ambulance transport, some interesting points are brought out. Three of the divisional ambulance companies had twelve motor ambulance cars, the fourth twelve horse-drawn ambulance wagons; and presumably these were all provided. But there was much confusion in the method of shipping the motor ambulance cars from America. The cars were sent to France with the parts unassembled, and a group of skilled mechanics was organized to put them together at St. Nazaire; but as the unassembled cars went to several other ports, the chassis sometimes to one port and the bodies to another, there was delay in getting all the parts together at St. Nazaire. A similar experience occurred in the shipping of hospitals, personnel and equipment being sent in some cases on different transports. A familiar story! The chief complaint in connexion with motor ambulance cars was their shortage for the work of evacuation from field hospitals to railhead and at the bases. All available cars were consequently pooled at hospital centres and at bases, and sent from there wherever and whenever they were required, returning afterwards to their pool. Eventually evacuation ambulance companies, corresponding to our motor ambulance convoys, were organized of twenty cars each. Twenty-one had reached the American Expeditionary Forces by the time of the Armistice, and 61 after it, the total number of ambulance cars shipped being 6,875, of which 3,805 were Ford cars. But before the United States entered the war, an American ambulance service was employed with the French. It became an authorized United States Army Ambulance Service, but remained with the French and worked independently of the American Expeditionary Force until the end of the war. At the time of the Armistice it consisted of 184 officers, 4,858 other ranks and a fleet of 113 sections of 20 Ford cars each, 152 touring cars, 94 heavy and 135 light lorries as well as motor cycles and trailers. Some of the sections were taken away on account of the shortage with the American troops.

Many were lost by shell fire or captured, and others were scrapped or damaged in accidents.

There appears to have been no want of ambulance trains. They were obtained chiefly from Great Britain; but the Americans organized ambulance trains for use on light railways. They were, however, top heavy, became derailed and were eventually abandoned. The total number of American patients evacuated to the base by the ambulance trains was 271,455 in 849 train journeys, of which 263 were in trains of the American Expeditionary Force and 586 in French trains; 60 per cent of the patients carried were wounded, 32 per cent sick and 8 per cent gassed cases. The duration of each journey was eight to thirty hours. Venereal cases were not evacuated but were retained with their divisions, and in time of battle sent back to duty. Those with the depot division occupied a V.D. Labour Camp, but the name was subsequently changed to Medical Labour Camp for the same reason that induced us to abandon the term Venereal Hospital in France.

Ambulance barges were also employed for evacuation, sixty being in use at the time of the Armistice.

After the German offensive on the Aisne in 1918, the evacuation arrangements were demoralized. The railway service broke down, and road evacuation failed from lack of ambulance cars. The medical service was severely criticized, especially by one of the newspaper correspondents. The Surgeon-General called for an immediate investigation; witnesses were examined on oath; the American medical services were completely vindicated, and the journalist in question frankly confessed that he was misinformed. An account of the criticism and investigation is given in detail. It is an object lesson in the way medical scandals are created in war, and how they can be promptly stopped by an immediate investigation and the authors of them brought to book.

Some points in connexion with administration are of interest. The Surgeon-General's office was on the lines of communication, but he had a number of deputies attached to branches of the General Staff at G.H.Q.; and also attached to the staff of the D.M.S. of armies, of which there were three. The Second Army, however, was organized only a short time before the Armistice, and the Third Army took no part in the fighting, but became the Army of Occupation in Germany. The Administrative Medical Staff of these armies appears excessive. The Chief Surgeon (D.M.S.) of the Second Army, for example, had a staff of twenty officers. The corps and divisional medical administrative staffs were also, from the British standpoint, excessive, being overloaded with specialists. Thus the corps surgeon (D.D.M.S.) had on his staff an assistant corps surgeon, an executive officer, a corps sanitary inspector, a corps medical gas officer, a commanding officer of the corps group of medical units, and consultants in medicine, surgery, urology, orthopædics, and psychiatry. The Second Corps with the British Force was organized, however, to correspond more with British administrative requirements.

There is little to note in connexion with the sections dealing with the operations in the field in the other sections of the volume; but the account of the Siberian Expeditionary Force, which was based on Vladivostock, and which co-operated with Japanese and Czecho-Slovàk troops, is of interest, as we have had no record hitherto of the medical services in that area of operations.

The printing, illustrations, and maps are excellent. Occasionally the expressions used are somewhat puzzling to British readers, such as "sight-seeing busses"—presumably a term for "char-a-bancs"—but otherwise the volume is full of interesting and important details, and our one regret is that it is too bulky to carry about in one's luggage; a momentous consideration for the R.A.M.C. officer with his frequent moves, although the price is by no means deterrent.

Clinical and other Notes.

A COMPARISON OF STOVARSOL AND EMETINE HYDROCHLORIDE IN THE TREATMENT OF AMŒBIC DYSENTERY.

By Major R. E. U. NEWMAN, O.B.E., M.C.

AND

Major R. M. DAVIES,
Royal Army Medical Corps.
(*From the District Laboratory, Quetta.*)

This investigation has been carried out on a series of eighteen cases of amœbic dysentery admitted to the dysentery ward of the British Station Hospital, Quetta. All the cases were specially selected. They were all cases in which there had been no history of dysentery within the past two years, and in which the presence of actively motile amœbæ with ingested red blood corpuscles in a characteristic stool left little doubt as to the accuracy of the diagnosis.

There was no selection of the drug to be given to any particular case, alternate cases being treated with stovarsal and emetine.

The specific treatment has been that outlined in the Army Headquarters, India, Medical Directorate letter No. 15044/22 (D.M.S. 3), dated August 6, 1925, which directed the investigation to be undertaken, viz. :—

(*a*) Emetine hydrochloride: one and a half grains by one hypodermic injection daily for twelve days, making a total of eighteen grains. The emetine used is that put up by Messrs. Parke, Davis and Co., in half-grain hypodermic tablets. It was received in the British Station Hospital, Quetta, from the Medical Mobilization Stores, Western Command, on January 8, 1924. In one case, to be referred to later, the course of eighteen grains was repeated after a suitable interval.

(*b*) Stovarsol: Eight grains daily for ten days, making a total of eighty grains. In two cases this course was repeated at suitable intervals owing to the recurrence of the dysentery. Stovarsol is manufactured by Messrs. May and Baker, Ltd., in four-grain tablets. It is stated to be of high arsenic content (twenty-seven per cent. approximately) and of low toxicity. The dose recommended is eight grains daily taken before meals. The tablets dissolve readily in half a tumbler of water which should be taken at a draught. Children take them readily either powdered or dissolved in water.

The general treatment adopted for each case, whether treated by emetine or stovarsol, has been recommended by Majors Acton and Knowles in their pamphlet on the "Dysenteries of India" (*Tropical Clinic*, first series), 1924, viz :—

(1) Complete rest in bed for at least ten days.

(2) Milk diet, beginning with milk alone and later adding milk puddings, eggs, beef-tea, etc., as the patient improved.

(3) A saline aperient in the early morning daily.

(4) Deek's bismuth treatment: Two drachms of bismuth carbonate suspended in half a glass of soda water three times daily, with the object of rendering the acid contents of the colon alkaline, and possibly of increasing the alkalinity of the portal blood-stream. The resulting alkalinity is at its height about two and a half hours after the administration of each dose of bismuth, and it is then, according to Acton and Knowles, that the emetine should be administered.

This general treatment was continued throughout the period of the administration of the stovarsol or emetine, and longer if colic or diarrhœa persisted. The patients were kept in hospital on a full diet for at least four to six days, after thecompletion of the stovarsol or emetine treatment and then if all clinical signs of the dysentery had ceased, and macroscopic and microscopic examination of the stools was "negative," they were discharged to attend for further observation.

The scheme of laboratory examinations of treated cases for "cure" or freedom from *Entamœba histolytica* cysts, which has been carried out, is that recommended in the Medical Research Committee's Report, No. 4.

The stools of all cases have been examined for cysts on six definite days, i.e., fourth, eleventh, eighteenth, nineteenth, twentieth and twenty-first days after the completion of treatment. The first examination was carried out while the patient was still in hospital, and the remainder while he was "attending." All cases have thus been under systematic observation for three weeks after the cessation of treatment.

The following table gives a brief description of the cases investigated :—

Case 6 died of pneumonia during a relapse of his attack of dysentery. He had shown no signs of cardiac weakness until the occurrence of the pneumonia, and post-mortem examination and sectioning of the heart-muscle revealed no signs of disease of that organ.

Case 16, who was on the malaria register, and was a somewhat debilitated and anæmic man, showed a very considerable improvement in his general condition on the conclusion of his course of stovarsol.

SUMMARY.

		Emetine hydrochloride		Stovarsol
1.	Number of cases treated	9	..	9
2.	Number of cases treated in which relapse occurred	1	..	3
3.	Number of deaths from amœbic dysentery or intercurrent disease	1	..	--
4.	Average number of days in hospital. Uncomplicated cases	17·6 (8 cases)	...	16·0 (6 cases)
5.	Average number of days in which clinical signs cleared up after commencement of treatment. Unrelapsing cases	8 (8 cases)	..	4·5 (6 cases)
6.	After effects	Inappreciable	..	Distinctly "tonic"
7.	Approximate cost per "course" of drug ..	Rs. 3.0.9.	..	Rs. 4.4.4.

TABLE OF CASES.

Case No.	Chief clinical signs	Laboratory report	Drug employed	Progress	Result
1/5650	Diarrhœa, tenesmus, blood and mucus, slight evening pyrexia. Duration, 2 days	Numerous free, active *E. histolytica* with ingested red blood corpuscles	Emetine 18 gr.	All clinical signs cleared up 5 days after commencement of treatment	Discharged 16 days after admission. No signs of recurrence. All routine examinations negative
2/9143	Diarrhœa, slight tenesmus, blood and mucus. Duration, 1 day	Actively motile *E. histolytica*	,,	Stools normal 4 days after commencement of treatment	Discharged 16 days after admission. No signs of relapse. All tests negative
3/3898	Eight typical stools daily, tenesmus, blood and mucus. Duration, 3 days	,,	,,	All signs cleared up 10 days after commencement of treatment	Discharged 19 days after admission. No signs of recurrence. All tests negative
4/7519	Diarrhœa, slight tenesmus, blood and mucus. Duration, 1 day	,,	,,	All signs cleared up 7 days after commencement of treatment	Discharged 16 days after admission. No signs of relapse
5/5682	Diarrhœa, slight tenesmus, mucus and a trace of blood in stools. Duration, 3 days	,,	,,	Complete recovery by seventh day after admission	Discharged 17 days after admission. No signs of relapse
6/3299	Diarrhœa, tenesmus, blood and mucus, no pyrexia. Duration, 3 days	Actively motile *E. histolytica*	Emetine 18 gr., followed by a second course of 18 gr. after 18 days' interval	All clinical signs cleared up 6 days after commencement of treatment. Discharged to attend 20 days after admission. Relapse 10 days after discharge. All clinical signs marked. Free active *E. histolytica* again present. Practically no improvement under second course of emetine. Died	Died of pneumonia, which came on 15 days after second admission for dysentery. Post-mortem examinations showed hypostatic pneumonia of both lungs. No definite ulceration of the large bowel, but marked congestion of the mucosa of the descending and sigmoid colon with six small, round hæmorrhagic areas, each with a dark centre. No degenerative changes detected in heart muscle
7/8346	Colic, tenesmus, blood and mucus. Duration, 1 day	,,	Emetine 18 gr.	A mild case. All signs cleared up on fifth day of treatment	Discharged 16 days after admission. No signs of relapse. All tests negative
8/3749	Diarrhœa, tenesmus, blood and mucus, pyrexia for 5 days. Duration, 2 days before admission	,,	,,	Clinical signs cleared up completely after 14 days' treatment. Blood culture on fifth day of disease, sterile. Stools negative for dysentery bacillus	Discharged to attend 23 days after admission. No signs of recurrence. All tests negative
9/3746	Diarrhœa, slight tenesmus, blood and mucus. Duration, 1 day	,,	,,	Blood and mucus ceased after 5 days' treatment. Diarrhœa continued for 12 days	Discharged 18 days after admission. No signs of relapse. Tests negative

10/3381	Diarrhœa, slight tenesmus, blood and mucus. Duration, 1 day	Actively motile *E. histolytica*	Stovarsol 80 gr., followed by second course 80 gr., with 10 weeks' interval	All clinical signs cleared up 4 days after commencement of treatment Relapse 10 weeks after completion of first course. A mild attack. Actively motile *E. histolytica* again present. All signs and symptoms cleared up 7 days after commencement of second course stovarsol	Discharged to attend 16 days after first admission. All routine tests negative Discharged to attend 10 days after completion of second course of stovarsol. No subsequent signs of relapse
11/2102	Diarrhœa, tenesmus, blood and mucus, twelve stools in 24 hours. Duration, 12 hours	Actively motile *E. histolytica*, culture negative for *B. dysenteriæ*	Stovarsol 80 gr.	All clinical signs disappeared 9 days after commencement of treatment	Discharged to attend 16 days after admission. All routine tests negative
12/5613	Diarrhœa, tenesmus, blood and mucus, mild. Duration, 1 day	Actively motile *E. histolytica*	,,	All signs cleared up 5 days after commencement of treatment	Discharged 15 days after admission. No recurrence. All tests negative
13/7432	Severe diarrhœa, tenesmus, blood and mucus. Duration 1 day	,,	Stovarsol 160 gr. in two courses, with 1 week's interval	Diarrhœa and mucus persisted for 10 days and then ceased. Discharged 17 days after commencement of treatment. Relapse second day after discharge. Free *E. histolytica* again present. All signs again cleared up 7 days after commencement of second course	Discharged to attend 37 days after first admission. Charcot - Leyden crystals found in stool 1 week after discharge. Thereafter all tests negative up to 6 weeks after discharge
14/8303	Severe diarrhœa, tenesmus, blood and mucus. Duration 1 day	Actively motile *E. histolytica*, cultures negative for *B. dysenteriæ*	Stovarsol 80 gr., followed by emetine 18 gr.	A severe case. Improved 6 days after commencement of treatment but relapsed on ninth day. Then put on course of emetine. All signs cleared up on sixth day after emetine commenced.	Discharged to attend 28 days after admission. All subsequent routine tests negative. No signs of further relapse 6 weeks after discharge
15/3417	Diarrhœa, slight tenesmus, blood and mucus. Duration 1 day	Free active *E. histolytica*	Stovarsol 80 gr.	Clinical signs cleared up in 4 days.	Discharged 16 days after admission. No signs of relapse. All tests negative
16/7481	Diarrhœa, tenesmus, slight blood and mucus, no pyrexia. Duration 12 hours	Actively motile *E. histolytica*	Stovarsol 80 gr. and quinine sulph. 10 gr. daily	Clinical signs cleared up in 2 days. Was on malaria register. Blood examation, negative for malaria	Discharged after 16 days. No signs of relapse. General condition considerably improved.
17/5830	Diarrhœa, tenesmus, blood and mucus. Duration 2 days	Actively motile *E. histolytica*	Stovarsol 80 gr.	A mild case. All signs cleared up on fourth day of treatment.	Discharged 15 days after admission. No signs of relapse. All tests negative
18/7936	Diarrhœa, slight tenesmus, blood and mucus. Duration 2 days	,,	,,	All signs cleared up in 3 days.	Discharged 16 days after admission. All tests negative

The number of cases which have been investigated is small; too small to enable one to say definitely that stovarsol is superior or inferior to emetine hydrochloride in the treatment of amœbic dysentery.

But the results so far are very encouraging and justify the belief that stovarsol is nearly as efficacious as emetine hydrochloride, and that it should be given a more extended trial in this disease.

The dangers attending the prolonged use of emetine, its depressant action on the cardiac and central nervous system, and its cumulative effects, are well known to everyone who has used this drug.

The danger of damaging the cardiac mechanism of young soldiers by an overdose of emetine must not be overlooked, and we believe that, except in particularly robust cases, the dosage should not exceed twelve to fifteen grains of the hydrochloride hypodermically for a course. On the other hand, the secondary effects of stovarsol in the dosage employed seem to be distinctly tonic.

With the exception of one case in which an erythematous rash over the head, neck and chest, accompanied by coryza and conjunctivitis, suddenly appeared and lasted for three days, we have seen no unpleasant after-effects such as diarrhœa and excessive peristalsis, while several of the cases treated by stovarsol have shown a marked improvement in their general health at the conclusion of the course.

This effect has been particularly noticed in a few children treated out of hospital. They seem to respond very well to the action of the stovarsol as shown by a distinct improvement in appetite, weight and general appearance, in addition to a rapid disappearance of the dysenteric signs and symptoms.

Other things being equal, the advantages of employing stovarsol in the treatment of amœbic dysentery in young children and debilitated persons are obvious.

We found, however, in all cases that in allaying the tenesmus and acute abdominal pains which usually characterize the onset of the disease, emetine appeared to give greater and more rapid relief than was obtained by stovarsol.

It is possible that a combination of the two drugs may eventually prove the best method in the treatment of amoebic dysentery, and it is proposed to carry out a further investigation on these lines during the next hot weather.

Travel.

JOTTINGS FROM A DIARY.

By Lieut.-Colonel C. R. L. RONAYNE (Retired Pay).

(Continued from p. 222.*)*

At 9.30 a.m. we berthed at the manganese ore berth, where we took in 1,200 tons of the ore, and this morning left it at 7 a.m. and went to No. 4 berth to complete our loading with tea and jute.

There is a large export of manganese ore from Calcutta for the blast furnaces of Middlesbrough, and it is a very useful form of cargo for ships like the "Novara," because not only is good freightage paid on it, but, as it is very heavy stuff, it acts as ballast or "stiffening" for the comparatively light cargoes of tea and jute. We nearly always take a thousand tons or so of the ore, but occasionally when we do not get any, we have to fill our water ballast tanks, which means dragging 800 tons of water along with us, thereby increasing the coal consumption of the ship, but at the same time there is, of course, no freightage charge for the 800 tons of water.

Going to sea as a ship surgeon has many attractions, but it is not quite all honey and locusts, and loading manganese ore is one of the trying times. How we loathe going alongside the berth for it! Imagine a dust more dirty, more penetrating, and more grimy then the finest coal dust, and you have the dust of manganese ore. It comes on board much like coal, that is, in the form of "slack" and lumps; in colour also it is a good deal like coal, only it is more of a brownish black, but in weight it is much heavier. The men who load and unload it get paid a special rate, owing to the irritating effect of the dust on the lungs.

It is pleasant to turn from ore to tea and jute. These are so clean and so easy to stow. The "Novara" has five hatches, and these are usually loaded from both sides of the ship, that is, the electric cranes on the quay put on board jute and tea from the large sheds on the quay, whilst the ship's cranes and derricks load from barges which come at the other side. In this way there are altogether ten gangs of stevedores loading at once, each gang sticking to its own crane or derrick. Sometimes at the two larger hatches (Nos. 2 and 4) three gangs work, making a total of 12 gangs. Working at full pressure about 1,000 to 1,200 tons can be dealt with in twenty-four hours, but half this amount would be a good average day's work.

Minor cuts and contusions are common enough, but serious accidents are fortunately few—even when the stevedores are handling unwieldly steel girders, machinery, and such like awkward and heavy cargo.

It is always fascinating and interesting to watch the loading and unloading of cargo, and see the way the shore-gangs, the winch-men, and the hold-gangs work together. It looks simple enough to the uninitiated, but there is much organization, method and experience required; and going from port to port one has plenty of opportunities to compare methods adopted, and the "team work" of the stevedores at the different ports. As may be expected, the stevedores of Calcutta are experts at loading jute, whilst those at Dundee are experts at unloading it.

But the handling of jute is almost child's play compared with that of steel girders and machinery. The Middlesbrough stevedores are said to be the most expert in the world at this job; how difficult it is may be judged from the experience at Immingham. When the Immingham Dock was first opened a few years back, local labour was used for stevedore work, but it was found they could make no "fist" of girders and machinery. I dare say, if allowed plenty of time, they could do it fairly well, but this sort of work has to be done "against time," as big ships have to "clear" quickly as they have to keep their appointed times, and besides, there are heavy dock dues for every hour spent in dock. So it was soon evident the locals could not rise to the occasion, and imported labour was necessary. Picked men were sent from Middlesbrough to instruct and assist, and now the local men are nearly as good as the Middlesbrough stevedores.

I have always been one of those who regard betting as a "mug's game," if I may be allowed a familiarism. Though I have not always lived up to this high ideal in my youth, still I think I can claim that in recent years I have atoned for my youthful indiscretions. But alas! this afternoon I fell once again, and, in a weak moment, allowed a friend to take me to the races. The first three races I tried left me about R. 50 "down"; so I decided to have a real "flutter." The race coming off was the fifth, and a good field of fourteen horses was turning out for it. My "system" for the flutter was to assiduously eschew all "tips"; take my stand in front of the Totalizer, and back for a "place" the horse with the least number of tickets on him. I duly took my stand but had some difficulty in deciding, as two horses were running one another very closely for bottom place. But as the time was nearing for closing the Totalizer I had to decide quickly, and as Major Conder's "Pomfret" had one less ticket on it than the other I backed it. The finish was a perfect beauty, with the whole fourteen horses up in a bunch—all except "Pomfret," and he was about two lengths in front of the bunch. I had a sort of double luck in backing him for a "place," because for a win he paid only Rs. 75·8 on Rs. 10, whereas for a place he paid Rs. 95·8! A rather unusual inversion of betting—but one with which I found no cause for complaint.

Sunday, February 10.—Went to the Zoo with P. There is really a very fine collection of birds and animals, and the lions and tigers and other indigenous animals are especially fine, as they live more or less in their native country, and besides, they are the pick of presents given by Rajahs

and other wealthy Indian Princes. For a long time we watched a most amusing and interesting little incident: A huge, powerful tiger with a beautiful sleek coat was gnawing at a bone; in his struggles to get meat off, he pushed it from one place to another, here and there little pieces of lean or fat being left along the track. Two tiny mice used to run out from a hole and shikar these crumbs from the great man's table. Whenever he "spotted" one of the mice, he clutched the bone between his great paws, stopped gnawing, showed his teeth and snarled. The mice would take not the slightest notice of his snarls, they simply kept at a respectful distance and "carried on." On one occasion a mouse ventured closer than usual, and the tiger snarled and hissed with increasing vigour; as he evidently realized the possibility of the mouse wresting the bone from him, he decided to take time by the forelock, and with a mighty roar he sprang at the mouse. The mouse bolted and shortly re-appeared as if nothing had happened; and the tiger went on with his gnawing, every now and again snarling. We were awfully amused and interested by a truly ludicrous entertainment.

Thursday, February 14.—The dining-room in the United Service Club is a very fine room, in fact, it may be called a "hall," it is so lofty and spacious, and, being surrounded by broad verandahs, is comparatively cool, even in the hottest months. Meals are served at large round tables capable of seating eight or nine. To-day I was having lunch there with a friend; several others, including an officer in khaki were at our table, but we did not know any of them personally. General conversation was going on amongst them, but my friend and I were chatting to ourselves, and in conversation I mentioned the town of Youghal. The officer in khaki, overheard this, and looking across the table said to me, "Do you know Youghal?" The following conversation then took place between us:—

"Yes, I know Youghal well, it is my native place. Why do you ask?"

"Do you know (so-and-so) who lives there?"

"Yes, he is an old friend of mine. Do you know him?"

"No, but I hope to soon, as I have just become engaged to his eldest daughter."

Another little proof of how small the world is!

Friday, February 15.—As I have had always rather a penchant for fossils, went to-day to the Museum, which is famous in this line. It is said the collection there of the fossil vertebrata of the Swaliks is the most complete and comprehensive in the world. Saw the huge shank-bone and breast-bone of the great wading bird, the Megaloscelornis. These are the only bones of this bird in the world.

In the fish section saw a good specimen of a stuffed porpoise—but no specimen of a dolphin. This, I think, is a mistake; as the two fish are of practical interest to travellers, specimens ought to be side by side for comparison. Everybody who has been to sea knows one of the "sights" of a voyage is to watch a school of porpoises or dolphins disporting them-

selves. Yet it is strange how few can tell one from the other. The word "porpoise" is used in a loose sort of way to describe both, and is used, even by "old sea dogs," many of whom do not know the difference between them.

The chief characteristics are as follows: porpoises seldom jump out of water; as a rule they only cut the surface, thereby showing only their backs and dorsal fins, and their motion suggests an air of business-like purpose and deep thought. On the other hand, it is the dolphins which give the pretty and fascinating display of gamboling along with their sportive leaps clean out of water, happy as larks, care-free and revelling in the joy of life. It makes one feel young to watch them. In addition to the above difference, they can be easily distinguished by the snout; that of the porpoise is bluntly rounded, whilst the dolphin has a tapered proboscis about six inches long. This difference in the snout is no mere academic or far-fetched one, it is so well marked that it can be distinguished easily, at 300 yards or more.

After the Museum, looked into the Victoria Memorial. It was designed by Sir William Emerson. Situated on the Maidan, in "splendid isolation," and built of polished marble brought from the State of Jodhpur, there can be little doubt that for elegance of design and execution it ranks as one of the world's masterpieces of architecture. It is truly a superb and fascinating pile. It stands as a permanent memorial to Lord Curzon, whose "push and go" saw the business through, though, I believe, in the face of much criticism. Yet he is represented only by a statue outside the ground's gate. I think he should be well inside it.

The Memorial is worth a visit if only to see the ornamental statuary over the entrance porches, which were designed and executed in Italy. Inside is a large collection of paintings, etchings, historical documents, relics, war-trophies, etc., the great bulk of which, are, in one way or another, connected with, and of interest in, India. Queen Victoria's private piano and writing-desk are there. In the lofty central hall, around the interior of the dome are beautiful mural paintings, but so high up are they, a proper view cannot be obtained, unless by climbing to the narrow gallery which runs round the done.

In one hall lofty scaffolding had been rigged up, and men were at work at the top of it. I asked a man what was wrong, and he said one of the stones of the arch was loose or cracked (he did not know which). But the point rather interested me, because, if I remember rightly, at the time the foundations were being laid there was a controversy amongst experts as to the method of laying them. I trust that it is not going to be a case of "St. Paul's number two."

Monday, February 18.—Passed three or four large turtles in the water —the first time I recognized them, though they are said to be fairly common about the head of the Bay. As a matter of fact, I believe I have seen them often before, but did not know what they were. They look for

all the world like clumps of dark floating seaweed, and I would not have "spotted" what they were this time, only I chanced to put the glasses on them.

By the way, I bought these glasses in London, just before we started on the outward voyage; and the more I use them, the more I am pleased with them. They are + 16 Zeiss.

In the Army + 6 is officially recommended, and + 8 allowed if desired, but higher magnification than this is taboo—or rather, used to be before the war; it was only recently I saw a young officer with + 12 Zeiss binoculars.

If the Army recommends + 6 or + 8, it is only natural ordinary individuals would regard these as the best; and so there is a big demand for glasses of these powers. And undoubtedly these are the best for *Army* requirements—but the requirements of the individual are not, I think, those of the Army. In the latter case, glasses are recommended largely because of the panoramic field of view, which enables objects to be compared, and so distances judged, maps to be drawn, etc. But you and I, on the whole, want glasses, not for panoramic effect, but to enable us to see a definite object, such as a house, or person, clearly at a distance.

The foregoing were my views, when I decided to purchase binoculars some years before the war. But I had no experience of the higher power glasses, and as I knew they would cost a good bit more, I determined to keep an unbiased mind.

At that time I was staying at the Strand Palace Hotel, London, from the roof-garden of which a magnificent view of the city can be got. So I went to Ross of Bond Street and got him to send me down + 6, + 8, + 10, + 12 on approval, and armed with the four glasses I went to the roof, and after a thorough test, had no hesitation in selecting the + 12. And I have never since regretted the selection—except perhaps a feeling they were not quite powerful enough; and gradually a hankering after + 16 had been developing, which I have just gratified, having first disposed of my + 12 at quite a good price.

The difference between glasses of different powers, as regards weight and bulk, is curious, and I do not understand it. For instance, there is not much difference between + 18 and + 25, or between + 12 and + 16. But the difference between a + 16 and a + 18 is considerable; the latter being heavy and cumbersome, and for this reason I think the + 16 is much preferable, as the small increase in magnification of the 18 is more than outweighed by the lighter, and less bulky, 16.

By far the greater number of passengers who possess glasses have + 6's or + 8's; only very occasionally one sees a + 12, and I have never met a passenger with a higher power than this. So on board ship I have plenty of opportunities of comparing my 16 with lower power glasses, and I find the difference is very marked. For instance, I can read plainly the

name of an approaching ship for a long time before a man with a + 6 or + 8 can make even a sporting guess at a letter.

I know the arguments against the high powers; the chief are: (1) the cost; (2) bulkiness; (3) jumping, or shaking of the object looked at; (4) and they "draw the eyes."

First-class glasses I regard as "money invested," so I would not hesitate about an extra "fiver" or so. I have already referred to the question of bulk. As regards "jumping," they of course cause some increase of this as compared with the lower powers, but I think this idea is much exaggerated, and personally I do not find the "jump" is sufficient to cause inconvenience, or blur the object looked at—and after all, this is one of the "acid tests" of any glass.

As regards "drawing the eyes," whatever that may mean. Personally, when using mine, I have never experienced a sensation of my eyes being pulled out of my head, nor any straining or tiring effect whatever, and I feel sure the ordinary individual who uses glasses only occasionally need not worry on this score if he happens to have a high power.

I am not prepared to admit that strain would arise from a high power, any more than from a low power in the case of those who have to use glasses frequently, such as officers on manœuvres, or the navigating officers of a ship. With modern lens perfection, and the arrangement by which each glass can be adjusted so as to ensure bifocal vision for each individual, I cannot see how strain could arise—except in the case of long continued observation, then the "jumping," no doubt, would have an unpleasant and trying effect. But under such a test I should think the difference in effect between a + 6 and a 16 would be small, and the one as tiring as the other.

The only real disadvantage I find is that a haze is well marked. Then lower powers are undoubtedly the better, as the high ones magnify the haze too much.

Anyway, I have had now a fairly varied experience of glasses of different power, and as a result I say give me + 16's every time.

Friday, February 22.—Arrived last night at 10.15 at Colombo. Some passengers disembarked, and their places have been taken by others. Put out 280 tons of cargo.

Quite a number of ships in harbour, including no less than four P. and O. ships, that is, "Moldavia," "Kalyan," "Sardinia," and ourselves ("Novara"). The American ship, "President Harrison," looks very fine. Of course a fine German ship is here, looking spick and span, and laden with cargo. There is no getting away from them, they seem ubiquitous! and always down to the Plimsoll-mark with cargo! The number of British ships here easily predominates, but in addition to the above-mentioned foreign ships, Italian, French, and Greek ships are at present in the harbour. Though, indeed, it is not always easy to apply the words "at present" to Colombo, as, I dare say, there is no harbour in

the world with a quicker and more varied "turn-over" of ships than Colombo. Many ships remain here only a few hours, and very few more than twenty-four. The stream of ships entering and leaving may be said to be almost continuous.

Until recently there was only an open roadstead, so that communication with the shore was practically impossible during the south-west monsoon, which lasts about four months. But all this has been changed by the present fine harbour, which covers exactly a square mile in extent, and is formed by three moles, that is, two land ones and a "detached" mole, the three forming two entrances for ships.

On approaching Colombo from the sea I should describe the view as commonplace and uninteresting, but once inside the moles, the array of ships and life in general is pleasing and interesting, though the buildings in the background look square. and lumpy. There is a good deal of green about, but quite impossible to say whether it is grass or palms until quite close, then the beautiful, graceful palms declare themselves. I have never noticed one that could be described as either "massive" or "grim."

Went ashore early in the morning and did some shopping, including buying a pair of cuff-links to replace those I recently lost. Gave a pound for an opal pair mounted in gold; I have just shown them to a passenger on board who is a jeweller, and he says they are well worth the money. After shopping had a row in one of the native boats; water in harbour quite bobbery owing to fresh north-east monsoon.

At dinner to-night I asked my railway conundrum. It is as follows: There is a continuous railway service between San Francisco and New York, and vice versa; that is, a train leaves New York daily at noon for San Francisco, and at the same time one leaves San Francisco for New York. From city to city takes exactly one week. How many trains will each train pass on the journey? It is quite a straight question—that is, there is no "catch" or "play" on the words, yet not one in a hundred gives a correct answer.

The answer is got by multiplying the—but perhaps you would like to have a go at it first, and I will give the answer later on.

Thursday, February 28.—Had a remarkable game of chess last night. The game developed without anything very special to note, until right at the end, when we found ourselves with the following pieces: my opponent had a knight and three pawns, and I had all my *eight* pawns but no major piece. I was about to "queen" one of the pawns when my opponent resigned; when he did so he was not in a position to take any of the pawns.

Of course I did not make any special efforts to preserve the pawns, indeed, I did not know I had them all, until I went to count them up when I lost my last major piece. I should think such an ending must be unique.

After the game we went out on deck for a breath of fresh air before turning in for the night. As we leant on the rail, away down on the horizon we could see the twinkling lights of Aden.

We always call there on the outward voyage but never on the return.

Aden is rather a quaint spot. It has rather a good harbour, but generally speaking the place is a sort of back-wash leading to nowhere.

That it has "strategic possibilities" is shown by the struggles for possession from earliest times. The Turks tussled with the Arabs for it. Marco Polo, the Venetian traveller, on his return from China, put in there for a drink. The Portuguese set out from India to try and take it. Eventually England took it from the Arabs in 1839.

Have you ever noticed what a delightfully picturesque and pleasing landscape Aden presents when viewed from aboard ship in the harbour? The colour scheme and the picture in general is unique. Not a tree nor a shrub to be seen, no patch of green, no waving meadows or golden corn in the "sear and yellow," in fact, scarcely any of the usual colours characteristic of landscape scenery. But the rocks present every shade of black, brown, grey, sienna and slate colour blended in pleasing harmony, relief from any tendency to monotony being afforded by the many picturesque white bungalows with their rich red roofs. All this rock and bungalow effect contrasts so charmingly with the deep blue of the sky above, and the sea in the foreground flecked with wavelets, with here and there Swali boys bending to their paddles, and a marauding Arab dhow careening to the flowing breeze; a few stately steamers, with curling smoke and shining brass, lying at anchor and looking on approvingly.

The *tout ensemble* effect is really pleasing and delightful, and the finishing touch is afforded by the way the bold beetling rocks are massed one behind the other in "gay theatric pride," with jutting, jagged crags and peaks, toned to a pleasing softness by the blending of the colour scheme.

How I envy those officers whose good fortune it is to serve midst such truly delightful scenery!

However, from the following incident, it would appear the charms of Aden have not always been fully appreciated; several formidable batteries line the heights, and about sixty years ago when the change in big guns came in, it was decided to replace the old smooth-bored muzzle-loaders by the then newly invented "rifled," and breach-loading guns. A young officer with a party of men was detailed for the job of dismantling and bringing down the obsolete ones; so up he went one January morning. Perhaps his sense of duty was numbed by the frosty winter air, but whatever the cause, instead of carefully bringing them down, as he had been ordered, he coolly took it on himself to chuck them, one after another, over the parapets, and allowed gravity to do the rest. The result is, to this day the old guns can be seen here and there lying on the hill slopes, whilst some even reached the beach, where they can be seen rusted and embedded in the sand. Such gross disobedience, of course could not be overlooked, so the officer was duly court-martialled, and "found guilty." The punishment inflicted was that he should spend the rest of his service at Aden. Punishment indeed!

Sunday, March 2.—Had a strong following wind yesterday, and it was remarkably cool (eighty degrees) for the lower end of the Red Sea.

Last night the fancy-dress ball went with a swing. A sports tournament amongst the passengers is going strong.

Monday, March 3.—Fresh gale against us all day and weather cooling rapidly, so got orders to-night for "blue" to-morrow.

This afternoon when playing a game of "buckets" I threw into the bucket twenty-one consecutive rings. A record, I should think.

Thursday, March 6.—Arrived at Suez about 4.30 a.m. yesterday; it was then bitterly cold as the crew fell in for medical inspection by the Port Medical Officer. But there is no getting away from this inspection, as Suez is the medical sieve, decided by International agreement, between east and west. I once had a practical experience of this: when returning from India on a troopship, a good many years ago, we put a sick soldier ashore at Aden. Before we arrived at Suez information had been telegraphed through to say the case had been diagnosed plague. The result was we had a terrible time of it at Suez! Not only did the medical authorities there disinfect the ship from truck to keel, but they took every man, woman, and child, ashore to the well equipped disinfecting station, and there they gave us mercury baths, disinfected our clothes, and generally seemed to take a malicious delight in inconveniencing us to the maximum. We were like sheep in their hands.

We had three ties-up in the canal, and so did not get through until 1 a.m this morning. After coaling left at 7.50 a.m. Light north-east breeze, and coldish.

The usual answer given to the railway conundrum is, six or seven trains are passed by each train on the journey. The correct answer is fourteen. It is curious, but nearly everybody fails to "spot" the fact that as a train arrives every day at noon, and as the whole journey takes one week, there must be seven trains already on the line when each train starts, and of course another seven start during the weeks' journey.

Tuesday, March 18.—Had calm sea, and light variable breezes through the Mediterranean. Calm and light easterly wind through "the Bay." Very cold north-east wind yesterday when we landed the passengers at Tilbury Dock at 11.30 a.m. Berthed in the Royal Albert Dock at 11.30 p.m.

The end of an excellent run, right through from Calcutta.

Current Literature.—Abstracts.

DOUGLAS, S. R., AND MEANWELL, L. J. **A New Method for the Concentration of Bacilli in Tuberculous Milk.** *Brit. J. Exper. Path.*, 1925, v. 6, 203-6 [1 ref.].

The authors describe a new method of concentrating tubercle bacilli in samples of milk, as a preliminary to microscopical examination. To 10 c.c. of milk are added 0·5 c.c. of trypsin solution. The tubes are incubated at 50° C. for three hours, or at 37° C. for six hours. After cooling, 5 c.c. of ether are added, the rubber-capped screw top with which the tube is provided is screwed firmly home, and the tube is shaken at least 200 times. It is then centrifuged for twenty minutes at 4,000 revolutions per minute. The contents separate into three layers, a clear ethereal layer on the surface, a gelatinous disc below this, and a clear fluid in the lower part of the tube. All the acid-fast bacilli are found in the gelatinous disc. Films are prepared from this intermediate layer, dried without heating, placed in ether-alcohol for two hours, and stained in the ordinary way. A table is given showing the superiority of this method to that usually employed.

W. W. C. TOPLEY.

Reprinted from "Bulletin of Hygiene," Vol. 1, No. 1.

HOOKER, S. B. **The Skin Test for Immunity to Smallpox.** *Boston M. and Surg. J.* 1925, v. 193, 212-14.

Vaccination is here considered principally as an immunity test. In view of the present threatening smallpox situation in the United States there has been prepared a short statement to show that vaccination is something to be desired, for in no other way can absolute community protection be achieved.

Those operated upon are classified into three groups, namely, the non-immune, the partially immune, and the immune. The non-immune are those who can be "successfully vaccinated"; immunity is held to become established about the tenth day; five to seven years is perhaps the average limit of its effectiveness.

The partially immune are those in whom only an abortive form of vaccinia is produced, reaching its height on the sixth day. Immunity is thus re-established. A large proportion of those who have had two vaccinia reactions are protected for life.

It is the third group, the immune, concerning which more care needs to be taken and closer observation made. In these the "immediate reaction" is all important, but is often neglected. Failure to inspect the vaccination site at the time of reaction is responsible for much futile revaccination and groundless complaint of inert virus. Observation and proper interpretation of this type of reaction does much to conserve time and material, to simplify

administrative control, and to enhance public appreciation of the desirability of smallpox immunization. This reaction attains its maximum in *forty-eight hours or less,* and appears as a small area of reddened induration with a variable zone of erythema. Itching is common.

In order to interpret these mild reactions with greater certainty it is desirable to prepare a control site on the other arm.

"The New York Quarantine Station records four grades of reaction:—

+ One in which there is slightly more swelling and redness in the vaccination scratch than in the control.
++ A definite reaction as compared with control.
+++ Marked reaction as compared with control.
++++ Very well marked reaction as compared with control.

"The Station does not accept a '+' reaction either for release or issue of certificate of immunity. The reaction must be definite. In order to observe these reactions, which are sometimes very fleeting, it is desirable to examine at the end of twelve, twenty-four, thirty-six and forty-eight hours. After failure to produce any type of reaction, revaccinate with new virus and observe every two hours if possible. With proper technic and a potent virus *the reaction of immunity evidences an eminently successful vaccination, and the existence of a high degree of resistance to smallpox.*"

The earlier the reaction the greater the immunity; the later reactions denote the greater susceptibility. The significant feature of the reaction is the areola; the day of its greatest development marks the time when the patient's body has formed and mobilized an effective concentration of antibodies.

Finally, it is urged that public inertia is likely to be overcome, not so much by the appeal to be vaccinated, as by the exhortation to have immunity to smallpox tested. "If you are immune it will not 'take' . . if you are not, the test will remedy that defect."

W. McC. Wanklyn.

Reprinted from "Bulletin of Hygiene," Vol. 1, No. 1.

Hackett, L. W. **The Importance and Uses of Paris Green (Copper Aceto Arsenite) as an "Anopheles" Larvicide.** 15 pp., 4 figs. [13 refs.].

Paris green, better known in Europe as *Schweinfurt green,* has the formula $3CuHAsO_3 + Cu(C_2H_3O_2)2$ and should contain not less than 50 per cent of arsenious oxide. In ordering, the arsenic content should be specified, as adulteration is common. Although hitherto somewhat neglected outside America this larvicide in the hands of Dr. Hackett has proved so effective, so simple in use, so inexpensive and so safe, that it must be considered an important weapon in the war against malaria.

In large-scale experiments in Italy the destructive effect upon anopheline larvæ was without exception, and no removal of algæ weeds or other

vegetation was required, while water repeatedly treated remained innocuous to domestic animals and to human beings.

The author gives the following description of his technique:—

"(1) *Dilution.*—Road dust is the cheapest and best diluent for Paris green. It should be screened and stored under cover in large quantities, since only a very dry dust can be used. If sufficient amounts cannot be obtained, we have found wood-ashes, spoiled flour, lime, fine sand and cork dust possible substitutes. Barber has recently suggested the application of Paris green mixed with oil, since larvæ will ingest droplets of oil on the surface of water.

"(2) *Mixing.*—Failures are due to improper mixing as well as to inferior quality of Paris green. Mixing should always be done mechanically in a tight box, or small barrel through which an iron pipe has been run diagonally for an axis and which can be revolved like a concrete mixer. A box 30 by 30 by 50 cms. will serve for 10 litres at a time.

"(3) *Distribution.*—This can be done by hand, throwing the mixture in the air in such a way that the wind will carry the dust cloud over the face of the water. This is the method of choice for large water areas. It is far more satisfactory with small bodies of water, to use the hand-blower or bellows employed by farmers to dust vines. The blower gives a good cloud and an even spread; the dust can be directed downwards so as to reach the water even in a strong wind; it automatically measures the amount of dust applied, thus cutting down waste (substitution of blowers for hand distribution at Portotorres cut down the consumption of Paris green 50 per cent); in dealing with overgrown ditches and thick reeds or bushes at the water edge, the nozzle of the blower can be thrust through the encumbering vegetation and the dust delivered directly on the water instead of on the foliage of the plants; and no special training in its use is necessary for youths in agricultural communities.

"(4) *Quantity.*—The tendency always is to use too much. This is corrected by demonstration, by use of mechanical blowers for distribution and by restricting the amount of Paris green in the mixture to 1 per cent. The object is larval destruction, and it seems impossible to apply even a 1 per cent mixture so lightly as to fail to secure this result. An exception is water covered with scum, which sometimes requires considerably larger amounts. A stronger mixture than 1 per cent might be used in case diluent material were very scarce, or had to be transported long distances at great expense. We have never had to use more than $\frac{1}{10}$ c.c. of Paris green to the square metre, under any conditions of obstructing or protective vegetation. Thus a litre (1,250 grams) of Paris green should control breeding over 10,000 square metres of surface or along ten kilometres of bank. The intervals between treatments should be shorter than the period required for *Anopheles* pupæ to develop, in that season and for that species.

"(5) *Precautions.*—The persons who distribute Paris green suffer no ill-effects if they take ordinary care to keep to windward of the dust-cloud,

change their outer clothing at the end of work, and wash their hands before eating. We had an occasional complaint of headache and diarrhœa in the first few days of our work in the period of hand distribution, but none in recent months. No skin manifestations nor burns were reported to us.

"With regard to the water treated, it has been established that Paris green in quantities destructive to anopheline larvæ does not kill culicine larvæ except in very shallow pools, and these, if present, may be used as a rough index of safety. Paris green does not harm fish of any kind (including *Cambusia affinis*) or domestic animals or vegetation."

The cost in Italy, inclusive of labour, worked out at about 10·20 lire (48 cents) per 1,000 square metres of water surface.

J. F. C. HASLAM.

Reprinted from "Bulletin of Hygiene," Vol. 1, No. 1.

Reviews.

PRACTICAL MICROSCOPY. By F. Shillington Scales, M.A., M.D., B.Ch.Cantab. London: Baillière, Tindall and Cox, 1926. Third Edition. Pp. ix, 332. 122 Illustrations. Price 8s. 6d. net.

That this little book, first published in 1905, should have reached its third edition is an indication that it has withstood the acid test of time, and a perusal of its pages indicates why this is so. It is essentially a practical book, which aims at giving in a concise form the essentials of microscopy, and in this object it certainly succeeds.

Beginning with an adequate description of the various parts of the microscope and their uses, it passes on to describe a selection of modern microscopes in a way helpful to anyone about to buy such an instrument. The author emphasizes the gratifying fact that British manufacturers have led the field in introducing improvements in the structure and efficiency of the stand, and in these details have been copied by the Continental makers. He believes that as far as really good instruments are concerned, better value can be obtained by buying a British stand, as for a lower price an instrument showing greater excellence of design cannot be obtained. Objectives, eyepieces, and accessories are then discussed, and in regard to the former due acknowledgment is made of the debt owed to Continental manufacturers, and particularly to Messrs. Zeiss, for the introduction of improved forms of optical glass, and the subsequent manufacture of apochromatic objectives. The practical optics of the microscope receive due consideration, but it is not unnecessarily elaborate or profound. Next is an excellent section on the manipulation of the microscope, followed by a short but clear chapter on photomicrography. The book concludes with a section on microscopical technique, which contains much useful infor-

mation on the preparation and mounting of specimens, on section cutting, and on staining.

This is a book which can be recommended to all army medical officers. Experience has shown that few know how to use to full advantage the microscope, which is probably the chief diagnostic weapon of the practitioner in the tropics. It is true that results of a sort can be got by using this instrument "anyhow," but to obtain reliable results in critical work, such as the examination of fæces for protozoa, correct manipulation is essential. Here, as in all things, "the little more, how much it is, the little less, what worlds away," and by a careful perusal of this book it will be found a relatively easy matter to acquire that very valuable "little more."

J. S. K. B.

INSTRUCTIONS FOR COLLECTORS: BLOOD-SUCKING FLIES, TICKS, ETC. By Major E. E. Austen, D.S.O. British Museum (Natural History). Pp. 28. Price 1s. 6d.

The authorities of the British Museum (Natural History) have published a fifth and enlarged edition of Major E. E. Austen's "Instructions for Collectors." The contents are arranged on the plan which has proved so practically helpful to collectors and others in the past. The author commences with general simple descriptions of the more important groups of blood-sucking flies, other than mosquitoes, and then goes on to explain how such specimens should be collected and preserved, protected from the depredations of ants or moulds, and sent through the post. Further notes are given on collecting other biting arthropods—fleas, bugs, lice, ticks, and smaller mites.

This new edition is assured of the warm welcome accorded to its predecessors.

W. P. MacA.

ARMY MANUAL OF HYGIENE. London: H.M. Stationery Office. 1926. Pp. 133 with 66 figs. Price 6d. net.

In the preface to the first volume on Hygiene of the Official Medical History of the War, emphasis was laid on the importance of individual sanitary effort and care on the part of each officer and man, and determination on the part of the higher and subordinate commands to enforce sanitary discipline. To the influence of the individual more than to the system was attributed the maintenance of a high standard of health amongst the British Expeditionary Force in France during the war. The instruction which was instituted by the establishment of an Army School of Sanitation at Aldershot for the training of the regimental sanitary detachments contributed greatly to this good result, and was productive of this issue of a "Manual of Sanitation" in its application to military life in 1907. The Manual was revised in 1920, after the war, and has now been still further

revised by its issue this year in the form of an "Army Manual of Hygiene." This last edition marks a great advance in educating regimental officers and other ranks of the non-medical services in the principles and practice of hygiene. It has been compiled specially for that class of reader, is admirably and clearly written and is profusely illustrated. There are eight chapters. In the introductory chapter the importance and value of sanitation as exemplified by the comparative losses by disease is pointed out, and this is followed by chapters on environment in relation to health, causes and transmission of communicable diseases, general and special sanitary measures, more especially in the field and in tropical countries, the disease vectors, and short notes on the more important preventable diseases. The final chapter describes the sanitary organization of the army on active service. There are ten useful appendices, with detailed information on such subjects as routine measures for the care of the feet, the prevention of trench foot, the organization of a corps school of sanitation, formulæ for fly poisons, mosquito repellers and vermin pastes, and the method of using germinated pulses for the prevention of scurvy, all of which are new and the result of experience gained during the Great War. We can imagine nothing more likely to be effective in the training of the soldier than putting this manual into his hands and giving him practical demonstration of what it contains. The compilers are to be congratulated on the preparation of one of the best books of its kind, and one that can be used by schools and other educational establishments with advantage all over the English-speaking world. It is exceptionally low priced and this should make it possible for everyone to possess a copy. It should not be confused with the "Manual of Military Hygiene," the last edition of which was published in 1921 and which is the manual for the training of officers and other ranks of the medical services, and consequently less elementary in character.

ROYAL ARMY MEDICAL CORPS TRAINING, 1925. London: H.M. Stationery Office. 1925. Pp. 383 with 111 figs. Price 1s. net.

Until 1911 there was no comprehensive manual for the training of the Royal Army Medical Corps, but in that year the principles involved in Field Service Regulations and in training manuals were embodied in one volume, which has now been brought up to date by the issue of "Royal Army Medical Corps Training, 1925." It is in two parts. Part A refers to military training, with sections on general training, drills and exercises, chemical warfare, medical services in the field, voluntary aid and the Geneva Convention, forming twenty-two chapters in all. The most important section, and an entirely new one, is that on chemical warfare. Its three chapters enter fully and in detail to the medical organization for dealing with gas casualties, the defensive measures against chemical weapons, and the disposal of the casualties. The information and system

of training set forth are, of course, the result of the experience of the medical services in the late war; but this is the first time clear and concise information and practical instruction on the subject have been presented in a training manual. The chapters are excellently arranged and the practical instruction is invaluable. The other subjects in Part A follow more or less the lines of the previous edition, but are much better arranged, while the writing is much more concise. The new organization of the field ambulance and casualty clearing station are important features; but there seems to be some mistake in the figure (fig. 3) showing a field ambulance in line by the right, as it allots four captains and a subaltern officer, in addition to the quartermaster, to the headquarter company. The next figure (fig. 4) of a field ambulance in column of route shows correctly only two captains and a subaltern to this company.

Part B of the volume deals with the technical training of warrant officers, N.C.O.'s and privates of the Corps. The three sections deal with anatomy, physiology and first aid, nursing, and food and cookery, with specimen hospital diets and a table of foods in season with times required for cooking as appendices. This last section on food and cookery is extremely good and of great importance, and will go far to enhance the reputation already gained by the R.A.M.C. for hospital cooking. Whoever masters the contents of the volume as a whole, no matter what his rank, will have the satisfaction of knowing that there is no part of field medical organization and the use of medical units in war, and no element in the training of subordinate ranks of the R.A.M.C., with which he has not been made thoroughly conversant. The volume should prove of special value to the Territorial Army branch of the R.A.M.C. and those engaged in training the St. John Ambulance Brigade, St. John and St. Andrew's Ambulance Associations and Voluntary Aid Detachments of these and of the British Red Cross Society.

APHASIA. By S. A. Kinnier Wilson. Psyche Miniature Medical Series. Published by Kegan Paul. Price 2s. 6d.

"Aphasia," by S. A. Kinnier Wilson, M.D., is the second book of the Psyche Miniature Medical Series.

This series of books is being published in connexion with the quarterly journal *Psyche*, and each is a true miniature, consisting of 100 pages, the whole book being little larger than a large-sized pocket book.

The work must not, however, be judged by its size, it is the best small book the reviewer has ever seen and at its modest price of 2s. 6d. one of the bargains of a commercial world.

Dr. Kinnier Wilson is noted for his clear teaching and his power of consecutive thought and expression. This trait is of great value in a tabloid book, in which, besides dealing with his subject in his own masterly style,

he makes many references to the bibliography of the subject, which will encourage readers to follow out his arguments in more detail.

Aphasia being but a symptom, and the different types of aphasia merely groups of symptoms of disturbances of the function of speech, the problem of its occurrence involves examination of the anatomical, physiological and psychological sides respectively, separately and, as the author points out, collectively.

He deals with each of these in successive chapters, then follow chapters on the classification of aphasic disorders, some clinical types of aphasia, and the final chapter on the treatment of aphasia.

The field of aphasia—as the author stresses—should be, but so frequently is not, the meeting place of the psychologist, the physiologist and the clinico-pathologist; then this interesting and complex symptom might be less vague and elusive for the general physician.

To anyone with any interest in the subject, from whatever point of view, this book cannot be too strongly recommended, its clear presentation of the details from various viewpoints, its numerous references to other authorities, and its wealth of condensed knowledge are of the greatest value, were the book many times its modest price. W. L. W.

HEALTH AND EMPIRE. Vol. i, No. 1. London: Constable and Co. March, 1926. Pp. viii + 95. Price 2s. 6d.

Health and Empire is a new periodical that is to appear quarterly as the Journal of the British Social Hygiene Council, an incorporated body formerly known under the name of the "National Council for Combating Venereal Disease." This, its first number, promises well. It commences with editorial comments, referring amongst other matters to the Imperial Aspects of Social Hygiene, the Belgian agreement for international free treatment at ports of seamen suffering from venereal diseases and the difficulty of applying it to certain Colonial ports without an Imperial subsidy, and some interesting remarks on the Bill drafted by the French Ministry of Health for the abolition of the State regulation of prostitution.

Dr. C. L. Burt contributes an article on the "Psychology of Social Hygiene," in which a somewhat close analysis is entered into on the causes of prostitution. "The Influence of Education on Social Hygiene" is treated in a short article by Dr. Percy Nunn. Dr. Bond has a well written paper on "The Attitude of the State and Society to Anti-social Disease," a term which he suggests should be applied to alcoholism, venereal diseases and all other diseases and disabilities which arise from misconduct. The treatment of the pregnant mother in the prophylaxis of congenital syphilis is discussed by Dr. Leonard Finlay in a paper contributed to the conference on "Hereditary Syphilis" in Paris last year. This series of contributions is concluded by an account by G. D. Knox of the conference held at the County Hall, London, in February last for the purpose of considering the

welfare of the mercantile marine in the Port of London, with special reference to the provision of facilities for recreation. We have always felt that the mercantile marine, that splendid body of men who did so much to save England during the Great War, has been much neglected by social workers, and that little has been done to improve the conditions of their life on board ship and in port. The Brussels agreement for the provision of free veneral treatment and the abolition of the custom that made seamen pay for such treatment on board ship or on shore are due in a large measure to the initiative of the Services Committee of the old N.C.C.V.D., and we congratulate the council on the advance that has been made in this respect since then and on the activities of the British Social Hygiene Council since its re-organization. An extremely interesting and useful journal concludes with several reviews, and an analysis of official health reports. If subsequent numbers of *Health and Empire* maintain the high character of its first issue, the Journal should prove a valuable instrument in the social progress of the Empire and the prevention of social diseases.

Correspondence.

ANTERIOR DISLOCATION OF THE SEMILUNAR BONE.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—In the August number of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS I was struck by the excellent reproductions of the skiagrams in Major Frobisher's interesting note on a case of dislocation of the semilunar bone. It is a pity that a lateral view was not given, as in the antero-posterior skiagram it is difficult to get an accurate idea of the position of the displaced bone.

He drew attention to the comparative rarity of the injury, so I venture to give a short account of a similar case which came under my care last year.

Serjeant V., 2nd Border Regiment, while playing football, fell on the palm of his right hand. The next day the wrist was swollen and painful, particularly in front, and a skiagram showed the semilunar bone to be displaced forwards, and rotated on a horizontal axis through ninety degrees, the concavity facing forwards instead of downwards.

Two attempts to reduce it under gas having failed, I exposed the offending bone by an anterior incision. Before removing it I decided to make a further attempt at reduction. Owing to the fact that I was now able to see exactly what I was doing, this proved successful. The bone slipped back into position without difficulty and full function was regained.

The serjeant plays first violin in the regimental string band, and I have had frequent opportunities for observing that his skill has not been impaired by the accident.

This injury is apparently not so rare as was at one time supposed. Thus, Choyce, in his "System of Surgery" (1923 edition), describes it as "relatively frequent"; whereas the following has been extracted from Cheyne and Burghard's "Manual of Surgical Treatment" (1900 edition), a large work of six volumes: "Dislocation of one carpal bone from another is of such extreme rarity that the accident does not require special mention"—nor does it receive it!

The above difference of opinion is presumably due to the improvements made in radiology during the last twenty-five years.

I am, etc.,

C. M. Finny, F.R.C.S.,

Major, R.A.M.C.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Any demand for *reprints, additional to the above*, or for excerpts must be forwarded at the time of submission of the article for publication.

Notices of Births, Marriages, and Deaths are inserted in the *Corps News*, free of charge to subscribers. All communications should be written upon one side of the paper only; they should by preference be typewritten; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS." War Office, Whitehall, S.W.1.

The Committee has sanctioned the publication of correspondence on matters of interest to the Corps, and of articles of a non-scientific character under a nom-de-plume. These communications must, however, be approved by the Editor before publication.

MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription is £1 (which includes postage), payable in advance. Single copies, 2s. per copy.

All subscribers to the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, whose annual subscription is paid direct to the Manager of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, will receive monthly a copy of the *Corps News*.

The *Corps News*, separate from the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, can be subscribed for at the rate of 4s. per annum, including postage, payable in advance.

Subscriptions for the *Corps News* separate from the Journal cannot be accepted from Officers on the Active List unless they are also subscribing to the Journal.

The *Corps News* is not on public sale, but obtainable only from the Manager, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS.

Cheques or Postal Orders should be made payable to the "Manager, Journal R.A.M.C." and crossed "Holt & Co."

All communications should be addressed to THE MANAGER, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," A.M.D.2, WAR OFFICE, WHITEHALL, S.W. 1.

All Applications for Advertisements to be made to—

G. STREET & CO., LTD., 8, SERLE STREET, LONDON, W.C. 2.

37

No. 5. November, 1926. Vol. XLVII.

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

BREVET-COLONEL A. E. HAMERTON, C.M.G., D.S.O., R.A.M.C.

ISSUED MONTHLY

IN ARDUIS FIDELIS

Printed and Published by
JOHN BALE, SONS & DANIELSSON, LTD.
83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

Price Two Shillings net.

VOL. XLVII. NOVEMBER, 1926. No. 5.

Journal

of the

Royal Army Medical Corps.

Original Communications.

SIDE-LIGHTS ON TUBERCULOSIS.

By LIEUTENANT-COLONEL F. E. GUNTER, D.S.O., M.D.

Royal Army Medical Corps (retired),
Assistant Physician, Margaret Street Hospital for Consumption and Diseases of the Chest.

WITH A FOREWORD

BY COLONEL S. L. CUMMINS, C.B., C.M.G., M.D.

AND

A POSTSCRIPT

BY H. A. ELLIS, M.B.

Assistant Physician, Margaret Street Hospital for Consumption and Diseases of the Chest.

FOREWORD

BY COLONEL S. L. CUMMINS, C.B., C.M.G., M.D.

COLONEL GUNTER has asked me to contribute a foreword to his interesting paper on the subject of tuberculosis, and I am glad to do so, as I think the subject one which should excite the interest of all officers of the Royal Army Medical Corps.

His claim for early diagnosis is one which cannot be too much emphasized. On the other hand, the question of the utility of tuberculin in pulmonary tuberculosis is one on which conflicting opinions are held by men of great experience, and perhaps the most pregnant paragraph in Colonel Gunter's article is that in which he pleads for the necessity of "personal study under a man with experience" before any attempt is made to treat patients by this method.

Tuberculin is a substance which is very difficult to standardize, and the preparations now upon the market are numerous and of varying potency.

As Colonel Gunter points out, tuberculin injections undoubtedly lead to auto-inoculations from tuberculous foci, and this consideration should be regarded as ruling out tuberculin treatment in all cases in which auto-inoculations are already taking place to an excessive degree.

It is undoubtedly true that tuberculin has become much less popular of recent years in the treatment of pulmonary tuberculosis, and that it has been altogether discarded in many sanatoria and hospitals devoted to the treatment of this disease. My personal opinion is that, used with great care in carefully selected cases, it tends to give valuable results; but whoever attempts to use it should have the fullest and clearest knowledge of the strength of the preparation which is employed and also of the precise state of the patient whom he is attempting to treat.

SIDE-LIGHTS ON TUBERCULOSIS.

By Lieutenant-Colonel F. E. GUNTER, D.S.O., M.D.

Royal Army Medical Corps (retired).

Assistant Physician, Margaret Street Hospital for Consumption and Diseases of the Chest.

Wilkinson says ("The Principles of Immunization in Tuberculosis") "every few years we should recast our ideas and bring our knowledge up to date."

In the past we have spent too much time over the physical signs in the lungs. If we wait till the appearance of definite signs of activity in the chest we have waited far too long. To give an example of this. Recently I examined the case sheets of fifty-eight ex-officers treated at Margaret Street Hospital. These officers all had tubercle bacilli in the sputum. In only 40, or 69 per cent, were there physical signs of activity, an error of 31 per cent.

The X-ray readings were somewhat better—53, or 91 per cent, showed activity from the radiographer's view-point. Still there was an error of 9 per cent.

With the modified von Pirquet, as described in detail below, all or 100 per cent reacted to dilutions of old tuberculin of 1 in 500 or 1 in 100.

The Modified von Pirquet Test—The value of the old von Pirquet reaction is not great. It is too sensitive and, consequently, the reaction occurs in too many healthy adults to be of real use in diagnosis. For this reason at Margaret Street Hospital we use the following modification:—

Old tuberculin is made up in the following dilutions: 1 in 10, 1 in 100, 1 in 500. Normal salt solution is used as a control. A drop of each solution is placed upon the forearm of the patient. The skin beneath the drops is scarified with a very sharp scalpel so as to draw blood, and a dressing is applied. Two days afterwards the arm is examined for signs of reaction.

The test as used in this manner is of value, as may be seen from the accompanying table:—

EFFECT OF THE MODIFIED VON PIRQUET ON 209 EX-OFFICERS UNDER OBSERVATION FOR TUBERCULOSIS.

Highest dilution in which a positive reaction was obtained	Number who gave reaction	Showed clinical or X-ray activity	Percentage of proved activity
1—500	65	55	84
1—100	117	75	64
1—10	22	2	under 1 per cent
Negative	5	nil	0

(It is hardly necessary to say that the figures under heading "Highest dilution" are "end reactions," i.e., 1 in 500 reacted also to 1 in 100 and 1 in 10 and 1 in 100, also to 1 in 10, and the 1 in 10 did not react to higher dilutions.)

From the above table it will be gathered that dilutions of 1 in 10, or stronger, are useless for diagnostic purposes, but higher dilutions, such as 1 in 100, or 1 in 500, are of decided value.

Unfortunately, I cannot give control figures, but I know that many patients who come to Margaret Street for diagnosis are negative, clinically, radiographically and also to the modified tuberculin test. I, myself, use only one form of tuberculin, "tuberculin albumose frei," both for testing and treatment. I hold no special brief for this preparation, but it has served me well and I see no reason to change it. The great thing is to get your tuberculin *from a reliable source*, such as Meister, Lucius and Brünning.

The Subcutaneous Test of Koch.—I used to employ this constantly, but I find now that I can get quite sufficient information for practical purposes from the modified cutaneous test, especially if taken in conjunction with X-ray findings.

Blood-pressure Readings.—It is sometimes stated that a high systolic blood-pressure is against the diagnosis of tuberculosis. It has very little influence. The average systolic blood-pressure in 100 of the above-mentioned officers was as follows: T.B. +, 135. T.B. –, but signs of activity, 140. T.B. –, but no signs of activity, 130. From a reading of the X-ray reports, I find that in cases in which there is much fibrosis there is a tendency to higher blood-pressure, and this is what one would expect.

Weight.—This is of importance. "The American Medico-Actuarial Mortality Investigation," vol. v, 1914, gives the following table:—

Age of insurance	Ratio of actual to expected deaths from T.B., taking 100 per cent as normal 5 to 20 lb. under weight	5 to 20 lb. over-weight
15–24	136 per cent	114 per cent
25—29	116 ,,	96 ,,
30—34	100 ,,	87 ,,
35—39	92 ,,	88 ,,
40—44	77 ,,	89 ,,
50 and over	73 ,,	79 ,,

That is to say, in the young subject light weight is of importance but lessens in significance with age. It is of special import if there be a history of mortality from tubercle bacilli in the parents. The Americans consider that in men over six feet two inches the mortality is greater.

Family History.—From the mortality tables it would not appear that a bad family history is of significance in people over 45 years of age. The death-rate in those insuring from 15 to 25 is actually less with a tubercular history in one parent than when a brother or sister is affected.

Question of Heredity.—It is generally conceded that tuberculosis is not directly inherited, but that it is contracted after birth. Wilkinson considers that some people are born with cells with poor fighting power. Ellis (see below) considers that these individuals are born with a poor biochemical make-up, and that the fault lies in the chemistry of the cell.

The Importance of Symptoms.

Symptoms, from the point of view of diagnosis, are of more value than signs, for, as I have said, if we wait till signs appear we have waited too long. The list of symptoms is protean and may affect any system of the body. I would go so far as to say, "exclude tuberculosis before making a diagnosis in cases of chronic toxæmia." I have gone on this system for some years with the happiest results.

At this stage it may be well to summarize in as few words as possible the present views as to the tubercular process as stated by Wilkinson. Infection occurs in childhood and may be considered a blessing, provided the dose be small, as it confers immunity against massed infection in later life. He says: "Tuberculosis is the result of action and reaction of two units of vital energy, the cell of the host and the cell of the parasite." The earliest lesion occurs anywhere in the air passages. The bacillus travels by the lymphatics and is carried to the tracheo-bronchial glands. The essential weapons of defence are the cells of the tissues, not the blood.

The first line of defence is the mucous membrane lining the air passages. The second, the tracheo-bronchial glands. It is then that secondary symptoms occur, especially endotoxæmia. If the second line of defence breaks, the tubercle bacilli burst through the lymph gland structure and spread along the lymphatic ducts that lead to the veins of the neck. They then get into the right heart, lungs and general circulation. In chronic phthisis tubercle bacilli are in the blood, but are inert in the vessels. Later, for reasons not yet known, tubercle bacilli settle down in the apices of the lungs.

Wilkinson likens tubercle to syphilis and divides it into three stages. The third stage is chronic apical phthisis which he compares to a gumma. He emphasizes the folly of waiting till the third stage before making a diagnosis. The time to diagnose tuberculosis is in the secondary or symptomatic stage. But diagnosis is impossible without the use of

tuberculin, for neither physical signs nor X-rays will help. It is at this stage that tuberculin in treatment does such undoubted good.

Mode of Action of Tuberculin.

There are various theories, but the most feasible appears to be that of Wolff Eisner. He considers tuberculin to be a foreign albuminous substance of low toxicity. This, however, becomes more toxic when it comes in contact with a specific lysin. A tubercular patient has in his body what Sahli calls tubercular lysin, and so gets reactions as a result of lytic action, whereas the healthy patient does not. The reason why tuberculin is not always satisfactory in diagnosis is because we do not directly diagnose tuberculosis, but the lysin content or hypersensitiveness.

You may get a reaction in the apparently cured because there is enough lysin in the body to produce it. Sahli points out that there is a very close connection between hypersensitiveness to tuberculin and immunity to tuberculosis. Hypersensitiveness is due to excess of lysin. He points out that in all endotoxic affections, it is probable that the antitoxic substances remain localized in the foci and do not get into the blood-stream. Hence they cannot be isolated, so their existence is difficult of proof. One significant fact, however, is that increasing doses of tuberculin diminish sensitivity. This must be due to an antitoxin; were it not so, each dose of tuberculin would tend to increase the hypersensitiveness. The action of tuberculin in treatment is probably as follows:—

By progressive inoculation lysin is increased and tuberculo-lysin is formed, hence reactions, but, as the dose of tuberculin is increased, antibodies are formed in a higher proportion than in the tuberculo-lysin.

If this theory be correct the aim in tuberculin therapy will be, first of all to overcome hypersensitiveness by frequent small but gradually increasing doses, and then, when reactions cease, to push the doses fairly rapidly till large doses, say 1 c.c., of tuberculin, are tolerated, so as to establish a high immunity. This is the practice of Camac Wilkinson, and I have followed his methods with good results.

Hypersensitive cases are by no means unfavourable so far as prognosis is concerned, but they require caution in treatment. According to Sahli, these cases have an excess of lysin, and if you start treatment with large doses of tuberculin, you are apt to get a dangerous amount of tuberculo-lysin set free before sufficient antibodies have been formed. For this reason I prefer to begin treatment in these hypersensitives with tuberculin inunctions. By this method reactions are avoided. When hypersensitiveness is overcome one can safely proceed to injections. Ellis says these cases are calcium deficients. They certainly improve rapidly on calcium or parathyroid.

Wolff Eisner explains fever and night sweats in tuberculosis as due to hypersensitivity. He considers them to be due to the lytic action on the products of the tubercle bacillus. He also thinks that rises in temperature

as the result of exercise are due to the fact that more blood is brought to the tubercular focus. Hence more tuberculin is absorbed and lysinized. This is most important. I have studied Patterson's charts on the effect of exercise on temperature, and have been much struck by the similarity they have to tuberculin temperature charts. In both series, in most cases, benefit is observed as the result of graduated treatment, and in both series also the harmful effect of tuberculin or exercise in unsuitable cases is obvious.

Concluding Remarks.

My chief object in this paper is to emphasize the importance of the early diagnosis of a tubercular affection, i.e., a tuberculosis that is showing activity. Most of us at one time have had a mild tubercular infection and, for this reason, may react mildly to tuberculin. Owing, however, to the protective influence of this infection and possibly also to the chemical condition of the tissues, little or no harm accrues, but, if for any reason activity is lighted up, it will show itself in symptoms and the diagnosis should be confirmed in the only way possible (at an early stage), i.e., by tuberculin. Tuberculin in diagnosis is not easy, and tuberculin in treatment is full of pitfalls, but once you have mastered the technique, which can only be learnt by studying for some months under a man who has experience, then you will be in possession of a very valuable addition to your medical equipment. As your knowledge of the subject increases, you will probably adhere less and less closely to your teacher's methods, for your plan of treatment must vary with the class of case with which you are dealing and the conditions under which you work, but once having learnt the principles of tuberculin therapy, you will not lightly discard them.[1]

POSTSCRIPT.

By H. A. ELLIS, M.B.

Assistant Physician, Margaret Street Hospital for Consumption and Diseases of the Chest.

Although there is no doubt that there is no heredity in transmission of tubercle, there is a question of hereditary constitution in its liability to occur. In this connection constitution can be divided into three types :—

(1) The normal, in which there is a balance between assimilation and elimination, between intake of fuel and output of waste.

(2) When there are difficulties of assimilation or a deficiency of intake of fuel.

(3) Where there is a difficulty of elimination of waste products and therefore an accumulation of ashes.

---

[1] I shall be glad to show my methods to any officer of the Corps at the Hospital, on any Thursday, at 11.30 a.m.

Naturally those who have a difficulty or a deficiency of assimilation will not tend to waste accumulation, and those who do suffer from such accumulation have not suffered from defects of assimilative power or a deficiency of food materials. The normal balanced people are in the middle between deficiency of intake and difficulty of output, and merge into those who display errors of assimilation on the one side and elimination on the other.

To understand the true basis of this position it must be remembered that all life's activities result in the production of acid as the result of vital metabolism, so waste accumulation must be of an acid nature and this type of constitution must be of an excess acid type, while the constitution which has difficulties in acquiring sufficient material for satisfactory metabolism becomes by contrast the acid deficient or the alkaline type.

Now these three types of constitution are hereditary, or at least a tendency in this direction is certainly transmitted to the offspring. Constitutions founded on such definite fundamental errors will naturally be subject to certain definite types of illness; so we find constitutions with a difficulty in assimilation of food material are liable to affections attacking the digestive functions and the lungs, while those who suffer from waste accumulation which affects the hearts and kidneys are liable to cardio-renal disease. The age at which these two constitutions are likely to show their deficiencies is also different. The alkaline or food deficiency type is essentially a condition occurring in youth, though it may last into age, while the acid waste accumulation errors naturally manifest themselves with age, as a deterioration of the functions of waste elimination normally occurs with time. The existence of one almost excludes the possibility of the existence of the other, and this we find to be the case.

The alkaline constitution presents difficulties in youth, and when these have been overcome the cases have a good old age without fear of cardio-renal disturbance, but cases of the acid type have a very good time during their youth, but with age their troubles begin to accumulate. The physique, mind and general appearance tend to demonstrate the class to which each one belongs, and this especially is so in youth, as in one variety the question of assimilation and all it entails becomes of supreme importance, while the question of restraint becomes the dominant factor in acid cases.

Fortunately the examination of the urine gives very definite indications as to which group an individual belongs, as the acid ammonia ratio varies very definitely with the different types of constitution and renders point to the statement that "Life is an acid function in an alkaline or neutral medium," to which one may add that the tendency towards a definite type is certainly hereditary, and in that sense the liability to certain diseases is a transmissible characteristic, but if recognized sufficiently early the effects of these constitutional characteristics can usually be avoided.

THE TACTICAL EMPLOYMENT OF THE MEDICAL SERVICES IN A CAVALRY CORPS.

By Colonel R. M. DOWNES, C.M.G., V.D.
Australian Army Medical Corps.

Among a number of interesting and authoritative articles that have appeared since the Great War on the methods of dealing with wounded in the field, the writer has seen none that has considered the problem from the point of view of the regimental medical establishments and field ambulances operating with cavalry. It is thought, therefore, that a description of what was done in this regard in the Desert Mounted Corps, the largest cavalry force employed in the recent war, may be of interest to readers of the Journal of the Royal Army Medical Corps; especially since the present war establishments and equipment, together with the instructions for tactical use of cavalry field ambulances laid down in the new Royal Army Medical Corps Training, differ materially from those to be described.

So that any views expressed may not be thought individual to the writer, it may be mentioned that this article has been submitted to Colonels D. G. Croll, G. P. Dixon and R. Fowler, of the Australian Army Medical Corps, and Lieutenant-Colonel C. E. Hercus of the New Zealand Medical Corps, who held the positions of Assistant Directors of Medical Services with Mounted Divisions in the Desert Mounted Corps; and they have expressed general agreement with my views. It is thought too that they do not conflict with the opinions of Colonels A. J. McNab, I.M.S., and W. Richardson, A.M.S., and Lieutenant-Colonel A. W. Moore, R.A.M.C. (T.), who held similar appointments in the Corps.

A brief résumé of the history of the Desert Mounted Corps may be given. It had its origin in the Anzac Mounted Division, consisting of three Australian Light Horse and one New Zealand Mounted Rifle Brigade, together with the 5th Mounted (Yeomanry) Brigade, which comprised the mounted troops of the northern section of the Suez Canal defences in 1916. The greatest part of the campaign in the heavy sand of the Sinai desert was carried out by these troops. Early in 1917 a second division, the Imperial Mounted Division, was formed from two Yeomanry and one Australian brigades, shortly afterwards renamed the Australian Mounted Division when a second Australian brigade replaced one of the Yeomanry brigades. These two divisions took part in the two unsuccessful attacks on Gaza. A third division was formed in the middle of 1917, the Yeomanry Mounted Division, whereupon the new formation, the Desert Mounted Corps was created. It took a prominent part in the capture of Beersheba, the advance up the Plain of Philistia and the capture of Jaffa, Jerusalem and Jericho. Towards the middle of 1918 reorganization took place in

consequence of the arrival from France of the Indian Cavalry and the withdrawal of a portion of the white troops for service in France.

The constitution of the Desert Mounted Corps was then as follows :—

ANZAC MOUNTED DIVISION.
1st Australian Light Horse Brigade.
2nd Australian Light Horse Brigade.
New Zealand Mounted Rifle Brigade.

AUSTRALIAN MOUNTED DIVISION.
3rd Australian Light Horse Brigade.
4th Australian Light Horse Brigade.
5th Australian Light Horse Brigade.
(Included a regiment of French Cavalry.)

4TH CAVALRY DIVISION.
10th Cavalry Brigade.
11th Cavalry Brigade.
12th Cavalry Brigade.

5TH CAVALRY DIVISION.
13th Cavalry Brigade.
14th Cavalry Brigade.
15th Cavalry Brigade.

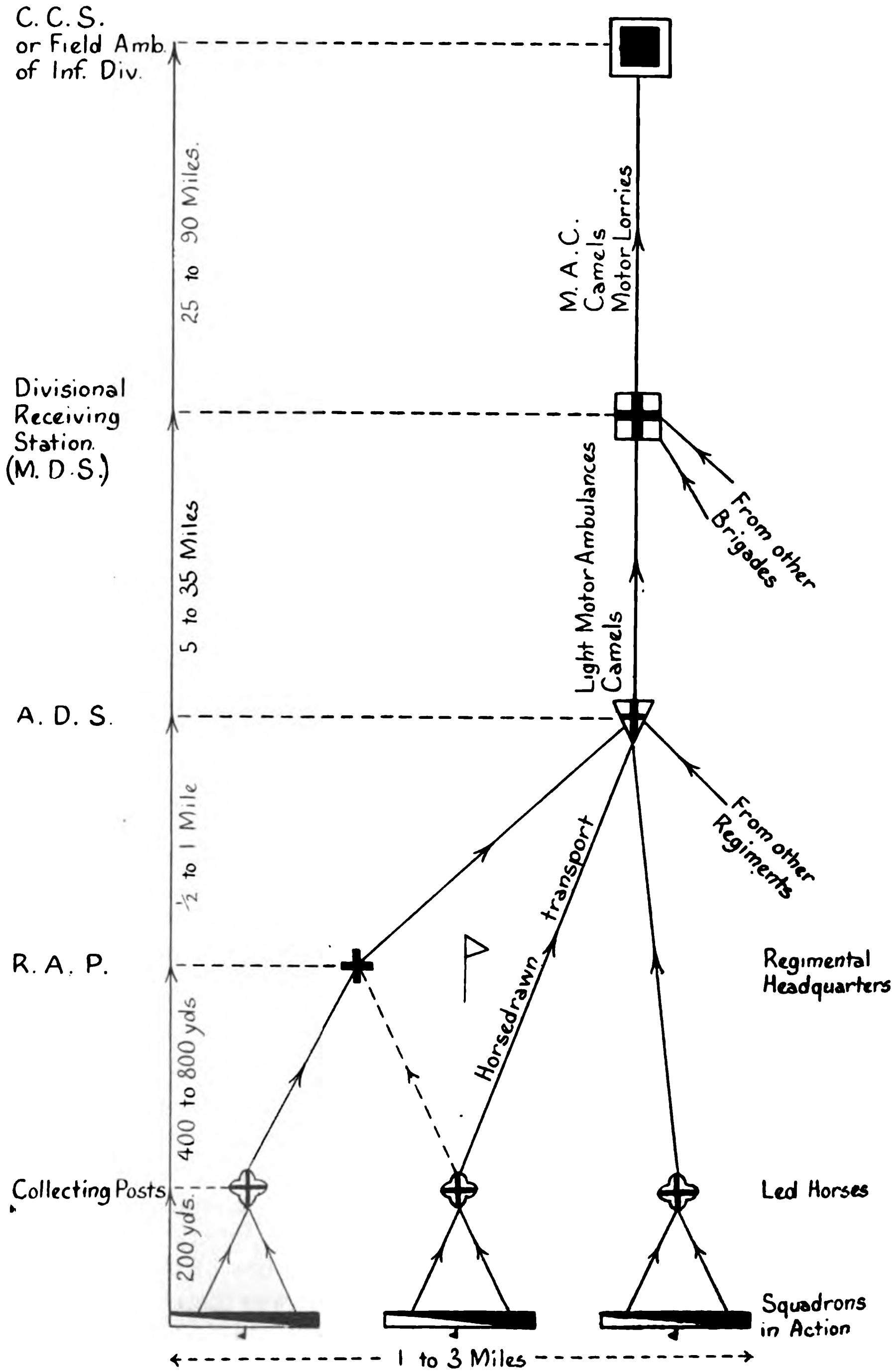
Each Cavalry Brigade with the exception of the 15th comprised one Yeomanry and two Indian Cavalry Regiments ; the 15th Cavalry Brigade was formed by three Imperial Service Cavalry Regiments (Indian).

The medical units consisted of five Australian Light Horse Field Ambulances, one New Zealand Mounted Field Ambulance, five Combined Cavalry Field Ambulances, one Indian Cavalry Field Ambulance and a composite French medical detachment; also a sanitary section to each division. In addition there were two improvised operating units, one bacteriological and hygiene field laboratory, and two malarial diagnosis units. These units took part in the operations in the Jordan Valley and the final offensive that resulted in the capture of Damascus, Aleppo, the remainder of Palestine and all Syria up to the border of Asia Minor. They had experience of evacuation of sick and wounded in the desert, in deep mud, in steep and rocky mountains unfit for wheeled transport; of long pursuits in more or less roadless country; of infantry attacks on prepared enemy positions and of intense malaria culminating in a tremendous epidemic (mostly malignant) with concomitant influenza.

The regimental medical establishments and field ambulances entered on the Sinai campaign far from perfectly equipped for the conditions under which they were to work. Numerous changes in equipment and organization were made during the three years of the campaign, but though there is much of interest in the means adopted to deal with the problems of evacuation in the desert, it is the organization at the end of the campaign that is most worthy of consideration.

In each regiment there were twelve stretcher bearers, four per squadron, two orderlies and three medical corps water duty men (withdrawn from all but Australian and New Zealand regiments towards the end of the campaign). Originally three Army pattern stretchers per regiment were provided, carried in a single Maltese cart, or on a camel where the sand rendered wheeled transport impracticable. But as a regiment frequently occupied a frontage up to three miles, the delay in transporting the stretchers to wounded who might be at the extremities of the regimental front rendered this arrangement impracticable. It was therefore necessary that the stretcher bearers of each squadron should carry their stretcher

SCHEME OF EVACUATION
IN THE DESERT MOUNTED CORPS.



with them. The regulation stretchers being too large and heavy to be carried on horseback, light portable stretchers were evolved, one carried by a stretcher bearer in each squadron. Such a stretcher, weighing only about nine pounds, consisted of two bamboo poles, which, with light traverse bars were carried rolled in the canvas bed into which the poles were slipped when prepared for use; the roll thus formed was strapped round with the slings, and carried in a leather bucket attached to the stretcher bearer's off-side stirrup iron and slung by a strap from his elbow. On these wounded were carried back to collecting posts formed in each squadron, under cover, perhaps 200 yards from the firing line, and at about the same parallel as the "led horses." Each collecting post was formed by one of the water duty men or medical orderly, who were trained in first aid as well as possible. The regimental medical officer with his orderly formed a regimental aid post in the vacinity of regimental headquarters, perhaps 800 yards in rear of the firing line. Wounded that required particular attention were brought to him by the regimental stretcher bearers, or on occasions he would go to the collecting posts; many of the wounded did not come under his care.

Though the textbook teaching visualized the field ambulance as carrying out most of the collection of wounded after the action was over, this was not the method usually adopted. Instead, wounded were collected as soon as possible, and while as many as could be were sent back on their horses or walked, the main object was to bring up the ambulance transport as far forward as possible to the collecting posts or even the firing line whenever there was sufficient cover. This could be more readily done with the two wheeled sandcarts or the sand sledges used during the desert campaign; the latter proved to be the most comfortable and efficient form of transport for seriously wounded in country in which they were suitable, statements since published to the contrary notwithstanding. Light ambulance wagons being larger and less handy could not be taken so far forward nor could they negotiate so well much of the rough and hilly country encountered, and for these reasons sandcarts, after their broad sand tyres had been removed, were never entirely discarded. It was only on certain occasions that the ambulance bearers were much employed in carrying wounded from the regimental area to the ambulance wagons. Their chief duty was to maintain communication between the ambulance and the R.M.O.'s and, acting as mounted wagon orderlies, to accompany the loaded ambulance wagons. In the first action of importance, the Battle of Romani, the transcendent importance of communication was at once patent. In this action information as to the location of casualties came to ambulances through the brigade headquarters to which they were attached; this method resulted in much confusion. After this a definite liaison between R.M.O. and ambulance was established by means of ambulance bearers, an arrangement that was highly satisfactory and most essential. As a result, instances of wounded remaining uncollected or of

unnecessary calls on the ambulance became rare. At a later date the difficulties of the ambulances in communication resulted in the issue of heliographs and signal lamps; the operators, who became remarkably efficient, were provided from the ambulance personnel. It is to be noted that the bearers were mounted, and supplied with portable stretchers similar to those carried by the regimental stretcher bearers. At the beginning of the campaign the bearers of only the Light Horse Field Ambulances were mounted, but each new ambulance on arrival in the force was provided with horses or mules, as without some such means of transport they could not accompany their units. There was a drawback in this sudden provision of horses, for many of the bearers naturally could not ride. The number of mounted bearers, thirty-six, reduced in 1917 to twenty-four, appears to have been greater than was necessary. Could some of them have been carried in motor vehicles so that they were not burdened with the care of their horses when hard put to it in dealing with a rush of casualties, it would have been a gain. However, the country traversed in following the cavalry would rarely permit of this, as must so often be the case in cavalry operations in many countries. The necessity for some mounted bearers nevertheless can hardly be disputed, and it would appear that a cavalry field ambulance without a portion of its personnel mounted will often be found seriously wanting.

The mode of collecting wounded just described does not of course apply to a charge or pursuit. In such cases the R.M.O. and his assistants at the rear of a regiment gave attention to the wounded as they fell and left them alone or in charge of stretcher bearers to await the ambulance wagons. In the case of a retirement, of which experience fortunately was limited, as many wounded as possible were packed into the ambulance transport, in some cases up to 12 in a sandcart constructed for two; any in excess could only be left.

The next stage in evacuation was the advanced dressing station. The general principle was to site this as far forward as circumstances would permit, in some cases within a few hundred yards of the firing line, but rarely more than a mile to the rear. Its personnel consisted of one of the two tent subdivisions of the ambulance with a few tents and the essentials only of medical equipment extracted from panniers and fracture boxes, together with a good supply of medical comforts, water and firewood. This tent subdivision, mounted on camels or donkeys, together with the bearers, transport for wounded, and wagons, camels or pack horses for equipment, formed what was termed the mobile section of the ambulance, and accompanied its brigade at all times. The remainder of the ambulance, consisting of the second tent sub-division, wagon orderlies and dismounted transport details with camels or general service wagons for equipment, was called the immobile section, being unable to move any faster or to a greater distance than its personnel could march on foot. Such a division of a cavalry field ambulance into mobile and immobile sections is essentially

similar to the present organization into headquarters and company. It was the custom to amalgamate the three (sometimes two only) immobile sections of each division into one somewhat ill-balanced unit designated a divisional receiving station. This unit was the keystone on which the whole system of evacuation was based in the larger operations. While corresponding to a main dressing station it, perforce, on many occasions took on some of the functions of a casualty clearing station. In general it was administered during an offensive as a Corps unit, the A.D.M.S. usually being too far ahead and out of touch with it to do so himself. Wounded were brought to it by the divisional motor ambulances or cacolet camels. In the two great advances the receiving stations were used in leap-frog fashion, the foremost when filled with patients being passed by those from the rear which had already evacuated theirs. The distance of a divisional receiving station from the nearest advanced dressing station commonly varied from five to thirty miles, though when the 5th Cavalry Division reached Aleppo the nearest was 120 miles behind it; this, however, was largely due to delay in the forward movement of medical units by overwhelming sickness which broke out in Damascus.

The means of evacuation from immobile sections or divisional receiving stations varied according to circumstances. In the desert it was by sand-carts and camel convoys of unemployed field ambulances of infantry divisions. For a brief period at the time and after the capture of Beersheba a portion of a motor ambulance convoy was available, but as a rule there being only one motor ambulance convoy for a force finally comprising eleven divisions, little could be spared for the Cavalry Corps usually far in advance of the infantry. Reliance had to be placed on returning empty supply and ammunition motor lorries which in most cases handed over the sick and wounded to field ambulances of infantry divisions, casualty clearing stations, except in stationary periods, being usually considerably further to the rear. When it is mentioned that formations of the Cavalry Corps in some cases were as much as 50, 60 and even 190 miles from the nearest casualty clearing station, with the methods of evacuation mentioned it will be realized how much devolved on the divisional receiving stations. In an extreme instance, in Damascus, a divisional receiving station with a strength of three medical officers and thirty-five other ranks, mostly Indians, had under its care over 800 sick, practically all of whom were seriously ill, and this, too, in and around a small house with no more than the usual field equipment and with a shortage of food and drinks suitable for invalids.

Though fine feats of marching were carried out by some of the receiving stations, the lack of transport was a great drawback. In the advance up the plain of Philistia after the fall of Beersheba and Gaza, the mobile sections of the ambulances were so far ahead of the divisional receiving stations, and so encumbered with wounded they could not evacuate, that the whole of the motor ambulance convoy cars had to be taken away from

their normal function and used to transport forward one of the divisional receiving stations in order to prevent a complete breakdown of the whole plan of evacuation. Even this would not have sufficed had it not been for help in evacuating other collections of wounded given by the divisional ambulances of the 20th Corps.

To one of the divisional receiving stations was attached the operating unit (formed essentially to provide early operative facilities for abdominal wounds) for the Gaza—Jerusalem advance. This unit was provided with a motor operating car and a general service wagon supplied from Corps headquarters; it was therefore more mobile than the divisional receiving station, so that when its work was finished with one receiving station it moved on to join up with the divisional receiving station that was furthest ahead. It proved itself of the greatest value. For the final offensive two other operating teams were added, but without any motor vehicles. Also to the divisional receiving stations the malaria diagnosis units were attached in the latter part of 1918. These units, of which there were two to the Corps, were miniature field laboratories and were invaluable. As events turned out it would have been better if one had been attached to a mobile unit and so available earlier in Damascus, where malaria with choleraic symptoms was being mistaken for cholera. The field laboratory, though unprovided with transport and so more or less stationary, carried out an immensity of work and was of the greatest value.

Before concluding, some features of sanitation may be recalled. It is noteworthy that in each sanitary section, which functioned with its division and never as an area unit, twelve of the rank and file were mounted; until this was done the distance apart of brigades in bivouac made sanitary inspection impossible, while as soon as the division moved on, it lost the use of its sanitary section. It was also found essential for the sanitary section to carry out a great deal of constructional work.

The most important sanitary feature, however, was the provision of portable sanitary equipment. Prior to this sanitation was inevitably bad after a forward move until sanitary stores could be brought up. When each regiment came to carry in a half limber sufficient sanitary appliances and disinfectants for its use the position was greatly improved, there was no wait for slowly arriving equipment and fæcal incineration—which was the rule—could be embarked on at once.

CAMPS, BILLETS AND BIVOUACS.

By Captain and Quartermaster G. A. COLLIER.
Royal Army Medical Corps.

On Active Service, the actual choice of an area for occupation and the distribution of troops therein, is determined by military necessities. When not in proximity to the enemy the health and comfort of the troops are the first consideration. (Field Service Regulations, vol. ii, para. 169.)

The selection of a camping ground is made by a staff officer, accompanied by an officer of the Royal Engineers and an officer of the medical service holding a hygiene appointment. (F.S. Regs., vol. i, sec. 177, and vol. ii, sec. 181, Training and Manœuvres Regs., sec. 56.)

Hospitals and camps for personnel should invariably be placed away from the railway main lines.

In the case of camps for personnel, provision of railway communication is not an absolute necessity and the further they are away the safer they are. (Manual of Movement (War), sec. 84, paras. 11 and 12.)

It should be a rigid rule that permanent or semi-permanent buildings are not to be erected until full consideration and approval have been given by the approved engineer and medical authorities.

When permanent or semi-permanent camps are necessary the design of the hut depends on the theatre of war. The subject is dealt with in Military Engineering, vol. vii. (Manual of Field Works, sec. 96 (7).)

Having regard to the tactical situation, the primary considerations are the arrangements necessary to safeguard the health of the troops, which include the supply of water, the facilities for obtaining shelter and fuel, and the delivery of stores and supplies.

The general principles to be observed are given in F.S. Regs., vol. ii, sec. 180-188.

Some important notes for camps and bivouacs are given in the Field Service Pocket Book, chap. II, sec. 10, which are followed by diagrams for camp arrangements.

It is recommended that sites of old camping grounds should be avoided. There is always the possibility of the ground and water supply being contaminated.

Camping grounds should be allocated definitely to mounted troops, dismounted troops and convoys respectively. Infantry camping grounds should not be used by mounted troops.

Gently rising ground facilitates drainage of surface water and if covered with grass and sheltered from north and north-east winds is most favourable for camping sites. A subsoil of gravel, sand or chalk is preferable, but

with a chalk subsoil the possibility of contamination of water supplies must be borne in mind.

The site for occupation by the troops should be selected with a view to the possibility of a prolonged occupation and should include sufficient area for expansion and provide a halting place for convoys.

First-class roads are essential approaches to a large encampment, therefore the relation of a good road to the proposed site for a camp should not be overlooked.

The sites considered *least* suitable for camps are: high hills and steep slopes, because of the difficulty in pitching tents. Narrow valleys, ravines and dry river beds, because of flooding during rains. Rocky ground, in which it will be difficult to dig pits. Large woods with heavy undergrowth. Low-lying meadows, which usually have a high subsoil water. Heavy clay soil, as the ground easily becomes waterlogged and is generally unsuitable for soakage pits.

When in the tropics endeavours are to be made to avoid sandy or desert places which have extremes of temperature, lack shade, and where intestinal diseases are likely to be carried by the mechanical irritation of sand. Low-lying marshy ground, and such places where mosquitoes are known to breed, should be avoided.

Native villages and irrigated surroundings are possible causes of water contamination and the prevalence of flies; they are also subject to outbreaks of contagious disease.

Billets and Bivouacs.

Instruction will be given in the occupation and preparation of billets and bivouacs. Men will be taught the importance of sanitation, and how to prepare food and look after their own comfort in circumstances resembling as closely as possible those of active service. (Infantry Training, vol. i, sec. 137.)

Simple shelters made with branches, hurdles, blankets, waterproof sheets, etc., are described in the Manual of Field Works, sec. 96, and in the F.S. Pocket Book, sec. 10, para. 43.

Types of bivouacs for a cavalry regiment, battery of artillery, and for units with many vehicles are shown on Plates I, II and III, F.S. Pocket Book.

Bivouacs admit of concentration and readiness, but are trying to the health of men in cold and wet weather and should be resorted to only in cases of tactical necessity. (F.S. Regs., vol. ii, sec. 169 (5).)

Billeting exercises are carried out when opportunity occurs, the object being to train officers and men in the telling off and the occupation of billets. (Training and Manœuvre Regs., sec. 45, para. 1 (vi) and para. 2.)

Instructions for billeting parties in regard to the selection and preparation of available accommodation, the water supply, local sanitary system,

the possible existence of infectious disease and for handing over occupied billets, are given in the Army Manual of Sanitation, paras. 155 to 158, and F.S. Regs., vol. ii, sec. 176.

It is considered that in houses having rooms between 15 feet and 25 feet in breadth, the maximum accommodation is two men for each yard of the length, and in rooms more than 25 feet broad three men for each yard of the length.

Data regarding accommodation in billets are given in F.S. Pocket Book, sec. 10.

In billets, particularly in close billets, some overcrowding is often unavoidable and special attention must be paid to ventilation. Doors and windows should be kept open whenever possible. Billets should be left scrupulously clean. (F.S. Regs., vol. ii, sec. 178 (3) (4).)

The closest hygienic supervision is necessary to mitigate the danger consequent on overcrowding, particularly when billets are used by a succession of troops.

Lay-out of a Camp.

The general rules for laying out a camp are given in the F.S. Regs., vol. ii, secs. 186 and 188. The direction of the prevailing wind should be noted before siting the sanitary area and pitching the tents. In all camps and bivouacs provision must be made for the following conservancy arrangements: latrines, urinals, night urinals, strainers and pits for greasy water, drains and pits for disposal of surface water and water from ablution benches, refuse pits or incinerators, manure dumps.

Latrines, urinals, refuse pits, horse lines, etc., are to be placed at least 100 yards from the field kitchens and from any source of water supply. (F. S. Regs., vol. ii, sec. 183.)

A system of surface drainage should be constructed. The importance of camp drainage and the method of cutting drainage trenches and surface drains is mentioned in F.S. Regs., vol. ii, sec. 186, which states that "half an hour's work on the first wet day, when the natural run of the water can be seen, will do more to keep the camp healthy than a day's work in dry weather."

Surface water must be prevented from running into wells by brick or concrete coping. (Manual of Field Works, sec. 97 (11).)

The conservancy arrangements will be explained to the men of the unit on arrival in camp before they are dismissed. (F.S. Regs., vol. ii, sec. 172.)

A plan showing the general sanitary principles to be followed when laying out a camp, is given in the Army Manual of Sanitation, fig. 21.

Tents.

Troops will not be under canvas in the United Kingdom between October 1 and April 30, without approval of the G.O.C. (King's Regs., para. 1626.)

The accommodation for all ranks and services and the scale of articles allowed for standing camps, camp hospitals and camp equipment for manœuvres, is shown in Equipment Regulations, sec. 10 and Appendix VII.

The internal diameter of a circular tent is 13 feet 6 inches, the floor space is 143 square feet, and the air space 500·5 cubic feet.

Normally one circular tent is to accommodate: one field officer or two junior officers, or ten N.C.O.'s and men, and on manœuvres the accommodation is: one commanding officer, or three other officers, or twelve other ranks.

Seven and a half yards should be allowed from centre to centre of circular tents. (F.S. Pocket Book, sec. 10, para. 42.)

The pitching spaces for other tents are: store tent, 60 feet by 75 feet; large hospital marquee, 80 feet by 55 feet; small hospital marquee, 45 feet by 40 feet.

In camp the usual interval between units is ten yards; between companies of infantry three yards; between squadrons and batteries the interval may be reduced to one yard. Tent flies are to be looped up the first thing every morning. Tents are to be struck periodically, the ground well swept and left exposed some hours at least, the tents being eventually replaced on their former sites. Tents should never be pitched for occupation in the "intervals." (F.S. Regs., vol. ii, sec. 186.)

Tentage exposed to infection is not to be returned to store until it has been disinfected. (King's Regs., para. 1360. Regs. R.A.O.C., para. 351.)

Wood bottoms for circular tents will be issued on the authority of the G.O.C. when, owing to the dampness of the ground or to other causes, their use is certified to be necessary by the D.D.M.S. (Equipment Regs. para. 257 and 258.) Applications should be carefully considered by local medical officers and only submitted to headquarters when the issue is essential for the health of troops. Wooden tent bottoms are to be removed and scrubbed weekly.

Marquees or store tents are provided for food preparation tents, dining tents and recreation tents. Food is not to be stored in men's tents and waste food is not to lie about either in or around them.

The scale of blankets and ground sheets issued to troops in standing camps is, two blankets and one ground sheet for each W.O., N.C.O., and man. The manœuvre scale is one blanket and one ground sheet, but a second blanket for each man is stored in ordnance departments in the manœuvres area ready for issue if specially ordered. The G.O.C. may authorize the issue of additional blankets in cold weather. (Equipment Regs., Part 1, para. 254 and Appendix VII.)

Bedding is to be placed outside the tents every day for airing.

When palliasses are issued straw is supplied at the rate of twelve pounds for each man. The straw is exchanged every thirty-two days. Without

palliasses or ground sheets seventy-two pounds of straw may be supplied for every five soldiers. (Allowance Regs., para. 691.)

The used straw is sold by the R.A.S.C. supply officer. The quantity of old straw should be at least seventy per cent. of the palliasse straw issued. The straw is obtained through the R.A.S.C. officer in charge of barracks by indent on Army Book 30 and is accounted for in the unit's Fuel and Light Return, A.F.F. 727.

Water Supply, etc.

The regulations governing the water supplies for troops and animals, when arrangements have not been made as a R.E. service, are: (1) The water supply is selected in conjunction with the responsible medical officer. (2) Permanent water guards are detailed. (3) Supplies from a stream are marked with flags; white for drinking water, blue for watering places for animals, red for washing or bathing places. (F.S. Regs., vol. ii, sec. 182.)

The source of the supply must be carefully investigated, and measures taken to prevent the pollution of the water between the source and "water point." Wells must be tested at the earliest opportunity and each well clearly marked as fit for drinking or for washing purposes only.

Whilst bivouacked in a temperate climate a daily average of one gallon per man is sufficient for drinking and cooking purposes; the allowance should be increased to two or three gallons per man in the tropics. In standing camps an average allowance of five gallons should be given for a man and ten gallons for a horse. (Manual of Field Works, sec. 97.)

The R.E. Manual on "water" recommends that each unit should arrange for storage of water.

Tanks and piping for water supply may be issued by the nearest officer in charge R.E. stores. (Instructions for T.A. Camps, para. 37).

Water supply stores are shown in the Manual of Field Works, Appendix IV, Table 14. (Note: The tanks waterproof 1,500 gallons, closed, are obsolete.) Water distribution stores are allowed on the following scale: Cavalry regiment, three sets; R.H.A. and R.F.A. battery, one set; infantry brigade, two sets. Each set weighs approximately 4 cwt., and consists of one lift and force pump;[1] one trough, 600 gallons and ten standards; four lashings (one inch by thirty feet) and one line Hambro; four picket posts, two feet six inches.

Vessels or tanks in which drinking water is stored are to be carefully covered, to keep out dust, etc., and they should be raised off the ground and provided with taps. Drinking direct from water taps should be strictly prohibited.

Arrangements must be made for cleaning out the tanks by scouring them with boiling water, or chemicals provided for the purpose, before they are taken into use and periodically whilst they are in use.

---

[1] A lift and force pump in good order can supply 600 gallons an hour at a combined lift and force of 60 feet with 4 men at work.

Water tanks and water bottles must be periodically inspected by a medical officer as well as frequently by platoon and other commanders. (F.S. Regs., vol. ii, sec. 173 (4).)

Instructions for T.A. Camps, para. 111 refers to the purification of water for drinking purposes by boiling, filtration, or addition of chemicals, as may be directed.

Paragraph 112: (*a*) Men who have had enteric or paratyphoid fever or dysentery; (*b*) men who are suffering from syphilis; (*c*) men who are employed in connexion with latrines, urinals or disposal of refuse, are not to be employed in: (i) The handling or purification of water for drinking or cooking purposes; (ii) the preparation or serving of food; or (iii) the cleansing of utensils used for the preparation of food.

Paragraph 113: The advice of the medical officer should invariably be obtained as to the source from which water for drinking purposes is to be obtained, and the necessity or otherwise for special purification. The strictest supervision is necessary to prevent contamination particularly in camps where water is not laid on by pipes.

Further details in regard to water supply are given in Military Engineering, vol. vi. F.S. Pocket Book, chap. II, sec. 12, and the Army Manual of Sanitation, para. 60-80, 126, and 139.

Instructions for the collection of samples of water for chemical examination are given in Appendix 7, Regulations for the Medical Services of the Army.

Cooking Arrangements.

It must be clearly understood that efficient arrangements for the preparation, cooking and serving of food play an important part in maintaining efficiency and resistance to disease. Every effort should, therefore, be made to maintain as high a standard of cooking as is possible under the difficult conditions of service in the field. (F.S. Regs., vol. ii., sec. 173 (2).)

All tins containing food will be carefully examined and none will be accepted which bear traces of rust round the joints, or which are badly dented. Blown tins will always be rejected. (Manual of Military Cooking and Dietary, 1924, as amended by Army Order 326 of 1925.)

Certain articles of food (e.g., vegetables and fruit) and drink are frequent sources of disease. Milk (other than sterilized or condensed) should be boiled before use. (F.S. Regs., vol. ii, sec. 173 (5).)

Arrangements for cooking in the open are described in the Manual of Field Works, sec. 98, and types of ovens and cookers are shown in plates 132, 133, 134 and 135; also in plates X to XIV, Field Service Pocket Book. The area allotted for kitchens should be placed to windward of the camp as far away as possible from the sanitary area.

Cooking apparatus: camp kettles, oval, twelve quarts, one for eight N.C.O.'s and men; ovens, Aldershot pattern, two per battalion; Soyer's stoves four per battalion, to be issued only when coal is used, as the use of

wood fuel in Soyer stoves is prohibited; butcher's implements, one set in a case for each unit.

Cooking utensils, including ovens and stoves, are frequently issued by R.A.O.C. with a coating of spirit lacquering, varnish or mineral jelly to preserve the iron work, and care must be taken to ensure that this preservative is burnt or wiped off before the articles are taken into use. (Equipment Regs., Part 1, para. 250.)

Weather-proof cover should be provided for cooks to enable them to prepare food properly and to provide for the storage of rations. A simple timber framework with end, sides and roof of corrugated iron will suffice. The roof should have a good fall. (Manual of Field Works, sec. 98.) A collapsible meat safe is described on plate 136.

A cooking shelter is shown in R.E. Services for Territorial Army Camps, fig. 8.

Overhead screens to protect the cooks from the heat of the sun are not included in Appendix VII (Equipment Regs.), but it is interesting to note that they are mentioned in the priced Vocabulary of Stores, sec. 2. The dishes which were issued with the Aldershot oven are intended for baking bread. They are unsuitable for cooking meat and they have been replaced by baking dishes 18 inches × 12 inches × 4¼ inches with drop handles. Each dish is capable of baking meat and potatoes sufficient for thirty-two men and nine dishes can be accommodated in an oven at one time. (List of Changes in War Material. No. A 1693, dated June 30, 1926.)

Fuel for cooking, three pounds of wood per day are allowed for each person. (Allowance Regs., para. 184.)

Before camp kettles are returned to store they are to be cleaned with caustic soda and greased with mineral jelly.

Two eight-gallon washing tubs are allowed for each dining marquee.

Special precautions should be taken to prevent ground in the neighbourhood of kitchens becoming fouled. (F.S. Regs., vol. ii, sec. 188(4).)

Travelling kitchens are not to be used in standing camps or where it is possible to construct field kitchens. Their use is restricted to brigade training, divisional training and manœuvres. (Equipment. Regs., Part I. para. 144.)

SANITARY AREA.

A definite area to leeward of the camp, as far as possible from the water supply, should be set aside as a "sanitary area," and in this area the latrines, urinals, incinerators, ablution benches, soakage pits, etc., should be placed. Filtration from the area must not reach the water supply.

Where bodies of troops are encamped or bivouac together, the horse lines, cooking places and sanitary area will be arranged by the O.C. troops in consultation with the A.D.M.S. (F.S. Regs., vol. ii, sec. 181 (4).)

Whenever possible the medical officer attached for regimental duty and at least two of the sanitary personnel should proceed with the advance party to make preliminary arrangements; when the camp is vacated a proportion

of the sanitary personnel should remain behind to assist in cleaning up the site and ensure that the ground is left in a sanitary condition.

On vacating a camp a certificate will be prepared in duplicate certifying that the camp site is in all respects left clean. (Instructions for Territorial Army Camps, para. 41.)

Latrines and urinals must be commenced immediately after arrival in camp or bivouac, even if these be only of a temporary nature, to prevent casual fouling of the area. A printed notice (A.F.W. 3322) was issued during the war which reads, "After using the latrine throw some loose earth into the trench."

The normal percentage of latrines is 5 per cent up to 500 men, and 3 per cent for a larger number.

Separate latrine and urinal accommodation is required for officers, warrant officers, N.C.O.'s and men, and for natives. (F.S. Regs., vol. ii, sec. 183 (4).)

Latrine screens are allowed on the following scale: one for officers, one for N.C.O.'s and two for a company of infantry. An additional screen may be issued for a bathing place if considered desirable.

Latrine paper, twenty reams are allowed for 100 persons, per annum. (Allowance Regs., para. 651.)

In all types of latrine covered boxes will be provided for latrine paper. (F.S. Pocket Book, sec. 41, para. 27.)

Deep trench latrines should not be dug in chalk soil. They cannot be used where the level of the subsoil water is high. (F.S. Pocket Book, sec. 41, para. 24.)

Field urinals are made by allowing eight foot run of trough for every 100 men, the soakage pits should not be less than three feet deep. (Fig. 9, R.E. Services for Territorial Army Camps.)

Night urinals are placed at each side of the ground for men's tents and one in the vicinity of the canteen.

These should be clearly marked "For night use only" and a lamp should be placed over each. The scale of camp equipment includes hurricane lamps for this purpose.

In standing camps, notice boards should be erected showing the position of latrines, urinals, refuse pits, etc. (F.S. Regs., vol. ii, sec. 188 (5).)

Aldershot Command Standing Orders require the sites for the night urinals to be marked with a pole. This arrangement is to direct attention to the urinals and strict orders should be issued and enforced to prevent fouling of the camp site.

Urine pits are generally prepared, but when urine buckets are necessary they are to be emptied twice daily. Night urine buckets are to be removed at reveille. All surfaces exposed to urine will be painted daily with a thin coating of pan oil, and one tablespoonful of pure cresol placed in each urine bucket when empty.

The R.E. Services for camps allow six per cent seats for the strength of

the rank and file, which includes separate seats for the N.C.O.'s. One seat is allowed for every ten officers.

The bucket system is only allowed when the owner of the camping ground objects to trenches or the medical officer recommends the use of buckets. (Equipment Regs., Part III, para. 138; Instructions for Territorial Army Camps, para. 70.)

At encampments where local conditions or circumstances render it impossible, or, in the opinion of the G.O.C. undesirable to dig trenches for latrine purposes and the pail latrine system has to be resorted to, latrine buckets [1] and urinals (and scoops) may be issued in the following proportions to the contractor engaged to remove the soil: latrine buckets (*a*) twenty per cent for officers, ten per cent for other ranks (Equipment Regs., Part I, para. 259). (*b*) Tubs, urine, eight per battalion and in proportion for smaller units.

When the bucket system is in use, the removal of night soil is arranged for by the R.A.S.C. as directed in A.C.I. 253 of 1922.

Arrangements are to be made to ensure that the service is performed efficiently: the contractor's bill is certified accordingly by the O.C. before being passed for payment.

After being emptied and cleaned the buckets are smeared inside with pan oil.

One gallon of water containing three tablespoonfuls of saponified cresol will be placed in every clean bucket in the latrine.

Ablution Places.

The site for the ablution places depends on the water supply. Washing should only be allowed at some distance from the water supply. (F.S. Regs. vol. ii, sec. 182 (5).)

Where ablutions are of necessity performed on the banks of a stream care must be taken to dispose of waste water at such a distance from the stream that it undergoes soil filtration before it gains access to the stream. (Army Manual of Sanitation, fig. 8.)

The ground surrounding the ablution place should be covered with coarse gravel to keep it dry.

The Army Manual of Sanitation, fig. 20 and the R.E. Services for Territorial Army Camps, figs. 4 and 6, show the forms of benching and soakage pits used.

Two washing-tubs, $3\frac{1}{2}$ gallons, are provided for every tent occupied by N.C.O.'s and men. (Equipment Regs., Appendix VII.)

Channels should be made to carry the waste water to a trap to strain off

---

[1] Only one pattern and size of bucket should be issued for latrine purpose. They are described on p. 324 of the priced Vocabulary of Stores as "Latrines, dry earth, buckets soil." (*a*) Cleaned by the contractor under the special conditions defined in the contractors' tender whether for "Closet Service," "Closet and Scavenging Services," or "Removal of privy soil." (*b*) Cleaned by the unit.

the scum, before the water enters a soakage pit or a herring-bone system disposal. (F.S. Regs., vol. ii, sec. 183 (2) v.)

Waste water from ablution benches, kitchens, etc., must be freed from grease before being discharged into soakage pits. (Manual of Field Works, sec. 97 (11).) Several forms of grease trap are shown on plate 139.

Bathing arrangements are necessary; the F.S. Regs., vol. ii, sec. 173 (9), states that arrangements for baths for the troops are of the utmost importance. Bathing piquets of expert swimmers are to attend the bathing places. Instructions for resuscitating the apparently drowned are to be posted up at the bathing places. (King's Regs., para. 761.) Territorial Army Regulations, para. 154 amplifies King's Regulations by stating that, if the bathing takes place in deep water, there shall be provided a boat afloat with a boatman and a good swimmer. The bathing picquet should be provided with life-buoys and life-lines.

If bathing places are not available, a swimming bath can be improvised with a water-tank, 2,300 gallons, described in the Priced Vocabulary of Stores, p. 30.

When the situation permits units should make local arrangements for hot baths. A sharp watch must be kept for the appearance of lice, scabies and other skin affections which are easily and conveniently detected by careful inspection at bathing parades. (F.S. Pocket Book, sec. 41 (3).)

A description of a portable shower-bath suitable for use in camps is given in the Army Manual of Sanitation, fig. 36.

Disinfectants.

The usual disinfectants, lime, cresol, pan oil, etc., are supplied by the R.A.S.C. officer in charge of barracks on the certificate of the medical officer.

Clarifying powder and water sterilizing powder are obtained from the R.A.S.C. officer in charge of supplies.

For general use cresol solution in the proportion of 1½ ounces to one gallon of water is the most suitable disinfectant. (F.S. Pocket Book, sec. 41, para. 14.)

Disposal of Refuse and Rubbish.

The keynote of camp sanitation is conservancy.

Camp refuse must be collected and burned, the residue being buried. In camps and bivouacs numerous small receptacles (sandbags, small baskets, etc.), must be provided for paper, cigarette tins and other rubbish, (Manual of Field Works, sec. 100.)

Temporary incinerators of turf, etc. (or refuse pits) are required not later than the first day of arrival of troops in camp.

These are replaced, as required, by more permanent incinerators. Several types are described in Army Manual of Sanitation, figs. 28 to 32.

Pits are to be filled in on leaving the camp and the sites marked. (F.S. Regs., vol. ii, sec. 183 (5).)

Camp refuse, wet or dry, should be placed in suitably covered receptacles. The receptacles should be distinguished by having words "wet refuse" and "dry refuse" painted on them respectively. They should be thoroughly cleaned with hot water when emptied.

Swill should be removed by a contractor once daily or oftener if necessary.[1]

If a contract for the removal of swill cannot be made it should be buried in deep pits.

Refuse must never be left in open pits. If pits have to be used the contents should be covered daily with a thick layer of earth. (F.S. Pocket Book, sec. 41, para. 20.)

Drying Sheds.

The necessity for the provision of a place in which the men may dry their wet clothing has been recognized. Braziers and fuel are issued on the certificate of the medical officer that these are a necessity. Aldershot Command Order, 1162, dated August 25, 1924.

The Territorial Army Instructions for Annual Camps, paras. 67 (v) and 120 refer to this service. Sixty pounds of wood or thirty pounds of coal are allowed per diem, for each stove or brazier used in authorized drying sheds when the medical officer renders a certificate that the issue is a necessity.

A simple framework of wood and cord, or wire, for drying clothes is described in fig. 37, Army Manual of Sanitation.

Horse Lines.

Horse lines should be so situated that the horses do not have to cross traffic routes to go to water. (F.S. Regs., vol. ii, sec. 169, para. 12 (vii).)

The Field Service Pocket Book, Chapter 2, gives further particulars for choosing a site for horse lines. Plate 6 shows the site at the rear of a camp and in the vicinity of the sanitary area.

A horse when picketed requires 3 to 5 yards between picket line and heel pegs; 5 feet between head ropes. (F.S. Pocket Book, sec. 10, para. 46.)

Horse and cattle lines should be cleaned regularly and the dung removed. Special orders must be issued regarding the disposal of manure. (F.S. Regs., vol. ii, sec. 173 (8); sec. 188 (4).)

The Instructions for Territorial Army Camps, para. 38, provide for the

[1] The special conditions in the tender for "Closet and Scavenging Services" under the sub-head Scavenging provide for the provision of receptacles with properly fitting covers and for emptying, cleansing and deodorizing the receptacles for ashes, dry refuse, greasy water and swill.

disposal of manure and the necessary arrangements are usually made by the R.A.S.C.

If such arrangements cannot be made, manure may be dumped and close-packed on a selected site not less than one mile from camp. Types of incinerators are shown in figs. 45, 46 and 47 of the Army Manual of Sanitation and the method of close-packing manure is described in para. 191 and illustrated in fig. 48. An excellent method for storing manure and trapping all fly larvæ attempting to leave the heap has been evolved by Captain E. Baber, South African Medical Corps. It is described in the Journal of the Royal Army Medical Corps, vol. xlv, No. 6, December, 1925, pp. 443-452.

Precautions against Flies.

"Flies are a source of disease and care is necessary to prevent them from breeding in horse-dung, dirt and refuse and from coming in contact with food." (F.S. Regs., vol. ii, sec. 188 (4).) Measures for the destruction of adult flies must not be neglected, but they can only be regarded as secondary to those which aim at prevention of breeding.

In all camps and bivouacs the utmost care will be taken to prevent the ground being fouled with excreta and refuse.

All foodstuffs must be protected from flies and dust. Meat safes should be provided in all units for the protection of food from flies. Latrine pails and trenches should be fly-proof. Horse-dung, stable litter and other refuse, which form natural breeding places for these insects, must be carefully disposed of. Spraying should be done in the evening or early morning when the flies have settled on the roofs and walls. After spraying the flies should be swept up and buried as many may not be killed outright. (F.S. Pocket Book, sec. 41, para. 21.)

A few handfuls of chloride of lime thrown inside deep trench latrines, morning and evening, act as a deterrent to flies that may try to gain entry when the latrines are being used.

Anti-fly measures to be taken by troops are described in A.C.I. 360 of 1922. Castor-oil and rosin is issued from ordnance stores for the preparation of "tangle-foot." The Manual of Military Hygiene contains instructions for dealing with the adult fly. The use of fly traps, fly papers and wires, fly poison, fly flappers, spraying with cresol or sodium arsenite mixtures are described in section 80 and Appendix VI of the Manual and in paras. 197 to 203 of the Army Manual of Sanitation.

Personnel.

Medical officers are charged with advising general and other officers commanding who will be held responsible if such advice is neglected without adequate reason. (King's Regs., para. 84.)

The officer in medical charge of a unit is responsible to its commander

for the efficient performance of the work of the regimental sanitary detachment.

The commander is responsible that all ranks render a loyal and intelligent assistance to the medical officer in the performance of his sanitary duties, and that the efficiency of the unit is not impaired through neglect of or non-compliance with sanitary rules. (F.S. Regs., vol. i, sec. 178.)

The Territorial Army Instructions for Camps (para. 111) require the medical officer to give systematic instruction to the sanitary and water duty personnel and also to the regimental pioneers, their duties being intimately connected with sanitation.

The officer commanding is to provide the medical officer with a nominal roll of the N.C.O.'s and men trained in sanitary and water duties, and these men are to be paraded separately when the unit is being inspected by the D.D.M.S. (T.A. Instructions for Camps, para. 93.)

Officers will pay particular attention to the health of troops in camp. The responsibility for the efficient supervision and for the remedy of sanitary defects rests on the commanding officers. (Territorial Army Regs., para. 34.)

Under all circumstances strict attention to the sanitary conditions of men's accommodation has a direct bearing on the efficiency of a Force. (Manual of Field Works, sec. 96.)

Amongst the pioneer staff are men who can perform the work of a carpenter, bricklayer, mason, painter and decorator, gasfitter and plumber. (King's Regs., para. 1495, and Peace Establishment, 1926, 1927.)

The arrangements for field sanitation depend largely on the skill of the pioneers who have to improvise the necessary articles from any available material. The pioneer staff carry out skilled construction work; other men of the unit are trained in the work of sanitation for troops, both in barracks and in the field.

The establishment of sanitary and water duty personnel of an infantry battalion is given in the War Establishments as follows:—

"Headquarter Wing": (1) One corporal and three men for water duties and two men for sanitary duties. "Each Company": Two men for sanitary duties.

The Territorial Army Instructions for Camps (para. 111) shows sanitary personnel as follows: Two men for units under 250 strength; one N.C.O. and three men for units over 250 strength; and one N.C.O. and eight men for units over 400. Water duty personnel: Units with one water cart two men; units with two water carts one N.C.O. and three men. (See also Territorial Army Regulations, paras. 399, 400, and 452.)

Duties.

The duties of the sanitary personnel are: To act as sanitary police in order to prevent soil pollution and to supervise:—

(1) The preparation and care of latrines and urinals, including the filling in of the same and marking of old sites;
(2) The systematic collection, removal, and disposal of refuse (by burning or otherwise);
(3) The construction of ablution places and the disposal of waste water;
(4) The sanitation of transport lines and cooking places in the area occupied by the unit.

See also Territorial Army Regulations (paras. 400 and 455, and Territorial Army Instructions for Camps, para. 111).

The pioneers are to assist if necessary in cleaning the lines.

The personnel engaged on water duties will not be employed on sanitary duties. Their duties are: (1) The daily supervision of water supply and its purification; (2) to take charge of all the apparatus and stores connected with the water supply of the unit. (F.S. Regs., vol. i, sec. 178 (3 and 4).)

Where special means of purification are adopted requiring personnel in excess of the normal allotment for water duties, two men per company or corresponding unit may be specially detailed for working the apparatus and providing pure water. (F.S. Regs., vol. ii, sec. 173 (4).)

A SUMMARY OF RECENT WORK ON LOBAR PNEUMONIA.[1]

By Major H. H. KING.

Indian Medical Service.

Officiating Assistant-Director, Central Research Institute, Kasauli.

(1) Introduction.

In connexion with the proposed use of vaccine treatment in the Army in India this coming winter, it was thought it would be of interest to sum up our knowledge of pneumonia and particularly of immunity against the pneumococcus. I shall not attempt more than to mention briefly the most important facts and conclusions reached. There has been such a great deal of work done that it would be tedious to give every reference. Accordingly only single references will be given, and then only for the less known facts, although they may have been established by more than one worker; facts already well known will be mentioned without reference. This summary has been greatly facilitated by the recent reports of the Medical Research Council, of the Ministry of Health, and of the earlier report of the Rockefeller Institute referred to under (A), (B), and (C). These and other works quoted contain valuable lists of references. An alphabetical list of references will be given for all authors mentioned here. Unless otherwise qualified, pneumonia stands for lobar pneumonia throughout this paper.

(2) The Organism Responsible.

(*a*) In about ninety-five per cent of cases (apart from particular epidemics) the predominant infecting organism is the pneumococcus. Evidence—in from ninety to ninety-five per cent of 1,500 cases (mainly in America) the pneumococcus has been isolated from sputum, blood, or lung by puncture. Since sputum, which may contain organisms other than the predominant organism in the lungs, was used in most of these cases, and since the percentage of pneumococcal findings in positive lung punctures is ninety-nine per cent (Lister, 1924) we may take ninety-five per cent as a conservative estimate. Lung puncture has the small risk of hæmorrhage; air embolism, a more serious risk, is avoided if the needle be attached to a syringe and not used alone—(A) q.v. for technique.

(*b*) Bacteriological diagnosis.—There is no reliable single criterion. Even bile-solubility is a matter of degree, and further, some pathogenic as well as non-pathogenic pneumococci are not bile-soluble (Malone, 1923 *a*). Bile-solubility in some strains was a variable character (A).

---

[1] Reprinted from *Indian Medical Gazette*, December, 1924.

(3) Typing.

(*a*) Standard antisera can be obtained from the Rockefeller Institute, New York. Differentiation is based mainly on agglutination with mammalian antisera in low dilutions—final 1 in 40 for I and II, 1 in 10 for III (C). Precipitin reactions yield parallel results—except sometimes with the (American) subtypes of II (C), and may be done with : (1) the peritoneal exudate of the sputum mouse; (2) the urine of the patient; (3) the bile extract of pneumococcal sputum—Oliver's method. The last two are rapid "clinical" methods. For this and other technique see (A), (B) and (C).

(*b*) The modification of the American classification proposed by Griffith (B) seems to be the best. In this the fixed types are single types, I, II, and III, while all others are in Group IV. The Americans place some strains as subtypes of II on the strength of agglutination by undiluted serum. French results are often not comparable because another technique (that of Porges) is used, involving the chemical treatment of pneumococci. Type III is *Pneumococcus mucosus*. This is a different organism from *Streptococcus mucosus* (C), but textbooks, e.g., Zinsser (1922 *a*) state the contrary.

(4) Distribution of Types in Cases.

(*a*) On the whole the distribution in North America and in Europe seems to be the same, roughly : I, 30 to 40 per cent ; II, 20 to 30 per cent ; III, 8 to 16 per cent in America, but only 0 to 8 per cent in North-western Europe ; IV, about 30 per cent. A good summary is given in (A), but the largest individual result (Cecil and Larsen) of 834 cases is omitted. The commonest types in IV in England are the American II subtypes and Lister's A (A and Urquhart).

(*b*) The South African distribution (in Africans) is different (Lister, 1917), I or C, 22 per cent; II or B, 16 per cent; III or E, 1 per cent; IV or A, D, F, etc., 61 per cent. Here A which is in IV was the commonest (and most severe) type, forming 31 per cent of the whole.

(*c*) Malone's (1923 *b*) findings in North-West India—in Indians of various races and mostly from other parts of India, approximate to the African (or rural?) type in the high percentage of IV, roughly : I, 28 per cent ; II, 17 per cent ; III, 8 per cent ; IV, 47 per cent. One type in IV formed 12 per cent of all types. No type in IV agglutinated with antisera to the commoner African IV types.

(*d*) More than one type is sometimes isolated—e.g., in eight per cent of cases (A). I and typical II have not been found together in cases (B)—nor in normal throats (Stillman, 1917).

(*e*) *Remarks.*—We must bear in mind that differences in distribution may be associated not only with place, but also with time, and perhaps with race and class or other environmental influences. Thus rural communities may have a higher proportion of IV than that given above for

American cities (Richardson). In a paper being published I show that Indian soldiers had a higher proportion of IV than Indian non-combatants (followers), and suggest that a high proportion of the fixed types is an index of defective hygiene, particularly in overcrowding; see sections 8 and 9. The possibility of errors in clinical diagnosis must also be remembered, for the IV group is much commoner in broncho-pneumonia. Lastly, particular epidemics—perhaps associated with influenza—have their own types. Thus at Camp Logan ninety per cent of cases (mainly lobar) were due to IV types (Hall and others).

(5) Severity of Types.

Practically everywhere III is the most severe and IV the least—but see paras. 4 (*b*) and 6. Individual strains of IV may be as virulent for mice and animals as I and II, but usually these fixed types—particularly I—are more virulent for mice than IV strains. The general level of mortality varies so much with countries and circumstances that averages would be misleading. Mortality tables are given in (A).

(6) Broncho-Pneumonia.

The percentage of cases due to the pneumococcus probably varies greatly; epidemics due to the streptococcus and to other organisms occur, as was the case in American army camps in 1918 and 1919. These were often associated with measles or influenza. One camp reported that the very great majority of cases were due to virulent pneumococci (Hirsch and McKinney). I have not seen adequate figures for endemic broncho-pneumonia—but twenty-two out of twenty-eight cases examined were pneumococcal (A). The percentage due to IV and the severity of IV, particularly in children, is greater than in lobar pneumonia (A).

(7) Distribution in Normal Throats.

(*a*) The pneumococcus was isolated from the saliva of 43·5 per cent of 485 normal people (A). The proportions of types were roughly: I, 2 per cent; II, 4 per cent; III, 16 per cent; IV, 78 per cent. Whilst in non-contacts the proportion of I and II was less than 1 per cent, in contacts it rose to 25 per cent (C). The figures are mainly from America. What the normal proportion of III is elsewhere remains to be determined. The remarks in 4 (*d*) also apply here. Thus in naso-pharyngeal swabs from 700 soldiers the pneumococcus was present in only 16 per cent (Sailer and others quoted in (A)).

(*b*) In convalescents the predominant type in the sputum changes in about a month to one of the normal type—even if the infecting type is III, or in IV, a change usually takes place (C). This is more probably due to the overgrowth of a type previously present in small numbers (as found in some cases) during the attack of pneumonia, than to mutation of the predominant type (B).

(8) Type Specificity.

(*a*) No change in type occurs on prolonged cultivation *in vitro* on ordinary media—though loss of virulence occurs.

(*b*) Miss Stryker's work suggests that when grown in homologous serum what amounts to a change of type occurs, the degree and stability of the change varying directly with the time of growth. The "original" type characters reappear after one or more animal passages. This important work needs repeating with single cell cultures and with several types and sera before conclusions can be made.

(*c*) An apparent mutation of a IV strain to type I after animal passage is recorded in (A), and another "mutation" by Clough.

(*d*) *Agglutination.*—Monovalent fowl antiserum agglutinated pneumococci of all types but in different maximum dilutions (Keys 1918), which tends to show that the difference in types by agglutination is one of degree. M. Clough reports that some strains are agglutinated by all three, I, II and III, antisera.

(*e*) *Protection of Mice.*—Only homologous sera protect (C)—but either I, II or III sera served for Clough's strains.

(*f*) *Curative Action of Serum.*—Only homologous sera are advocated, and in practice only I serum for I cases (C). A type-overlapping curative power is claimed for his monovalent sera by Truche, and for antibodies from serum by Cecil and Larsen.

(*g*) *Other Reactions.*—(i) Pneumotoxin. The reaction to an intradermal injection of dissolved pneumococci after previous sensitization is not type specific. (Kolmer and Steinfeld, Kolmer and Weiss).

(ii) Similarly, antihæmolytic reactions of immune sera are not type specific.

(iii) Complement-fixation tests are not absolutely type specific.

The last two facts are quoted and the whole problem discussed by Cole and Moore.

(*h*) *Remarks.*—The subject is important both for treatment and for prevention. More evidence is required. We must remember that the specificity of immunity reactions is one thing, and the type fastness (or otherwise) of pneumococci is another.

(9) Infection.

(*a*) The evidence of 7 (*a*) and (*b*) allows us to presume that direct or indirect infection occurs from cases.

(*b*) The dust of ordinary rooms and of rooms occupied by cases gave practically the same relative distribution of types as given by normal and contact throats respectively (C).

(*c*) I know of no evidence that many cases are due to direct infection from other cases—here and there groups of cases with a common source, often a healthy person, are described. The South African mine cases

showed no evidence of the importance of direct cases to case infection (Maynard).

(*d*) In localized "epidemics" different types are often recovered from cases presumably infected from the same source (Zinsser, b). The same happened in experiments on monkeys (Cecil and Blake, b). This does not negative the importance of infection, but suggests the type mutability of pneumococci or (what is perhaps more probable) the type multiplicity of infection.

(*e*) It is commonly suggested that infection plays a greater part in I and II than it does in IV cases, where auto-infection perhaps occurs. The importance of healthy carriers of I and II is shown by Stillman (1917) and by (A). The carrier condition usually lasts about a month.

(*f*) There is good evidence, either for indirect infection from cases, or for what I may call "intensive crowd infection," in that local epidemics occur in conditions of crowding, particularly among recruits or labourers when newly brought together. For work on pneumococcus immunity and the suggestion of exaltation of virulence by the transference of organisms at the right stage see Bull, and for an experimental *in vitro* proof see Bloomfield and Felty, Felton and Dougherty.

(*g*) Pneumococci, mainly of Group IV, are more often found—in nearly twice as many instances—in individuals suffering from colds or influenza than in quite normal people, and such pneumococci are more virulent. (Gordon).

(*h*) *Suggestions.*—Apart from the obvious hygienic measures indicated, it would seem sound to allot recruits more room than seasoned men. Spittoons in barracks might be useful. More windows or skylights in Frontier and Punjab barracks would probably be of use; the latter could be covered over with thick straw mats in the hot weather—pneumococci soon die on exposure to light.

(10) Pathology of the Onset.

(*a*) Clinical evidence and the seasonal and regional incidence of pneumonia suggest that reflex vasomotor changes in the respiratory passages following chill assist in the production of attacks by producing favourable local conditions—it is unlikely that general immunity is so variable, but evidence is needed.

(*b*) A great deal of experimental work has been done (see Permar, who gives a list), of which the most important is that of Cecil and Blake (1920 a) on monkeys—the rabbit is too liable to septicæmia to furnish a good analogy for man. Summing up, we may conclude that :—

(1) Infection of the upper (supralaryngeal) respiratory passages alone does not produce pneumonia. Unnatural organisms are quickly removed from these regions—Bloomfield quoted by Stillman (1923).

(2) Intravenous or subcutaneous injection does not produce pneumonia.

(3) Infection of the lower respiratory passages, even in minute doses (given in one cubic centimetre of liquid), causes pneumonia. "Probably this infection must reach at least as low as the bronchi"—C. and B., above. It is more probable that to produce the disease the infection must always reach the lung alveoli, except when direct infection of the tracheal lymphatics is caused by the needle—see Jones and Stillman (1923).

(4) The start of pneumonia is the penetration of the bronchial or lung epithelium and infection of the lymphatics. This is followed by the infection of lymph glands near the root of the lung; from there as a focus an interstitial inflammation spreads outward into one or more lobes.

(*c*) Accordingly, in man the first important factor is infection of the lower respiratory passages. Clearly this can be direct by inhalation of the sputum spray of others, or indirect by extension from the pharynx, auto-infection. Paragraph 9 (*g*) is significant of the part catarrhs may play in both processes. Extension may be furthered by reflex vasomotor changes which may assist also in the next process to be discussed.

(*d*) The second factor is penetration of the epithelium and mucous membrane. The fate of carbon particles suggests that in man the alveolar epithelium is readily penetrated—perhaps by the carrying action of leucocytes.' General and local immunity processes (specific and non-specific) here play their part. Possibly specific local immunity is of importance—perhaps epithelial alone, or perhaps of lung tissue generally. Mice could not be infected with sprayed pneumococci that reached the lung (Stillman, 1923), which suggests a natural local immunity.

(11) Pathology of the Course of the Disease.

(*a*) 30 per cent. of blood-cultures were positive (C). They are sometimes positive very early. They are usually negative at or soon after the crisis. A positive blood-culture, particularly if late in the disease, is a bad sign. Contrary to textbooks, pneumonia should be regarded as a local infection that is continually attempting to become general—and with success sometimes.

(*b*) A rising leucocytosis (polymorphonuclear) is a good sign.

(*c*) Recovering cases (before the crisis) show not only a diminution of cocci in the blood, but also in the lung and sputum (Rosenow, quoted in A). Therefore we may not look upon pneumococci in the focus as shut off from the action of the body, though it is possible that within this area a large part of the final destruction of cocci is brought about by their own ferments and products, as suggested by Lord and Nye.

(*d*) At or soon after the crisis, certain type specific antibodies can be demonstrated in the serum of the majority of cases—except in type III infections, when they are rare. These are agglutinins, precipitins, opsonins, and "protectins"—to coin a word. The persistence of these is very variable—from a few days to four months (Chickering, 1914).

(*e*) The pneumotoxin reaction is given before the crisis and sometimes for a few days afterwards—see 8 (*g*).

(*f*) The first process of recovery is probably associated with immunity reactions leading to the destruction of living pneumococci in the blood, and to the removal or neutralization of their dissolved endotoxins—the effective use of immune serum is followed by the abolition of bacteræmia (C).

(12) Acquired Immunity.

(*a*) Second attacks are more frequent in those once attacked than are first attacks in those never attacked.

(*b*) Such attacks are more common in the earlier period after an attack than in the later (Maynard).

(*c*) This is against Lister's suggestions that such attacks are due to the disappearance of specific antibodies from the blood. It is also against exogenous infection by new types, but is in favour of infection by types already present—perhaps by a strain accompanying the predominant one. It suggests either that infection of the lungs, or that individual susceptibility, is of more weight in determining the onset of pneumonia than specific immunity reactions are in preventing it.

(*d*) The evidence in 11 (*d*) on serum antibodies suggests that type-specific acquired immunity is short, but these substances do not represent the whole action of immunity—see later.

(13) Active Immunity in Man.

(*a*) From the discussion on Lister's prophylactic work (1924), I conclude that no striking benefit in the diminution of total incidence has been proved; further, this is the opinion of some competent local observers. I suggest that the addition of the results for 1917 to the last table in the discussion would clarify matters. Lister notes the very great diminution—abolition in one mine—of A, B and C cases following the use of A B C vaccine, and advances it as proof of success. This argument, based on a redistribution of types, may not be used as proof of benefit. As a controlled result it can be used as a proof of the action of vaccine, plus either type mutability or type multiplicity of infection. It certainly suggests benefit, so that possibly all that was wanted was better controls. Here I must protest against Lister's idea, that, because vaccination may be of indirect benefit to the unvaccinated by diminishing the total infective conditions, therefore the use of the alternate individual method is vitiated. This is not so, for a good control is obtained for the same infective conditions; whether these as a whole are changed by the vaccine may be deduced from a comparison with a second absolutely unvaccinated control. Maynard's statistical analysis of Wright's results on the Rand leads him to conclude that vaccination has a protective effect, but for not more than about four months—its protective value is greatest shortly after inoculation and progressively diminishes.

(*b*) The American results at Camp Upton (Cecil and Austin) were good—no cases of I, II and III (the vaccine types) occurred, and the incidence of IV and of streptococcus cases was less than in the unvaccinated. More information is required as to how the statistics were obtained, though these are perhaps accurate since the period of observation was only ten weeks. The controls, unfortunately, were regimental units. On the whole—though not conclusive—these results are very suggestive of benefit for a short time. The controlled results at another camp (Cecil and Vaughan), though not so good and though complicated by influenza, were good on the whole—the results in seasoned men seemed better than in recruits.

(*c*) Specific antibodies are demonstrable in the serum of the vaccinated—these occur later if a lipovaccine be used than with the ordinary saline suspensions (Whitmore, quoted by Cecil and Vaughan). Lister states that, contrary to natural acquired immunity, these antibodies sometimes persist for as long as eight months.

(*d*) I conclude that the results so far are no more than very suggestive of a good effect, particularly over short periods, of prophylactic inoculation, and that conclusive evidence of benefit, over say six months, has not yet been obtained.

(14) Active Immunity—Experimental.

A great deal of work has been done; as before, that on monkeys by Cecil and Blake, 1920 (*b*), and by Cecil and Steffen, 1921, 1922, 1923, is most valuable.

(*a*) After subcutaneous vaccination type-specific antibodies, as mentioned, are demonstrable in the serum—but seldom against III. The intravenous route requires smaller doses than the subcutaneous.

(*b*) Protective power for mice does not always correspond with the presence of agglutinins and opsonins—a serum might protect and not agglutinate and vice versa (C).

(*c*) Such antisera are not distinctly bactericidal or antiblastic (Barber)

(*d*) Subcutaneous and intravenous vaccination produce active immunity against infection by the lungs or by other routes, except with III and some strains of IV, when immunity is often not produced (Cecil and Blake, and Cecil and Steffen above).

(*e*) Such immunity is not necessarily associated with the presence of the antibodies mentioned. The converse also holds, that serum can be protective and yet the animal be not immune.

(*f*) The duration of this immunity, so far as I know, has not yet been determined.

(*g*) A variable degree of immunity to other types is also produced.

(*h*) Such immunity is more readily produced (in monkeys) against infection by the intravenous route than against intratracheal infection; the importance of local cellular immunity is suggested by Cecil and Blake.

(*i*) Intratracheal vaccine produces immunity to infection—by the intra-

tracheal route, and this in most cases without any specific protective power of the serum, which suggests cellular immunity (Cecil and Steffen, 1922). It remains to be determined whether immunity can be so produced to infection by other routes.

(*j*) Specific whole-blood immunity is produced almost as well by intratracheal as by intravenous vaccination, and better than by the subcutaneous route (Smiley and quotations). This is a "bactericidal" action which includes the action of leucocytes. This whole-blood bactericidal action is mainly type-specific, but some destruction of other types occurs; it appears before agglutinins appear (Heist and Solis-Cohen, 1919).

(15) Natural Immunity.

(*a*) Some normal human sera protect mice without agglutinins, etc., being demonstrable (P. Clough).

(*b*) The blood of Europeans had more phagocytic power for pneumococci than that of tropical Africans; further, Europeans responded better to immunization (Wright, 1914).

(*c*) Whereas phagocytic mixtures of serum plus leucocytes and of defibrinated or decalcified blood plus leucocytes leave all the ingested pneumococci alive, whole-blood phagocytosis is accompanied by the death of large numbers of pneumococci (Wright, 1912).

(*d*) Similarly, Heist and Solis-Cohen (1918) report that the difference between the bactericidal action of the blood (including leucocytes) of susceptible and resistant animals could not be demonstrated if the blood were first defibrinated. But with a special technique Robertson and Sia show that the leucocytes plus serum of resistant animals (dog or cat) kill pneumococci, whereas those of susceptible animals (rabbit, etc.), do not. This bactericidal action does not occur if the serum be previously inactivated.

(*e*) Normal horse serum (as well as immune) inhibits the growth of pneumococci (Barber).

(*f*) The immunity of pigeons is mainly due to phagocytosis in the spleen and liver and not to serum reactions (Kyes, 1916).

(*g*) But the serum of fowls protects mice to a moderate extent (Bull and McKee, quoted by Robertson and Sia).

(16) Passive Immunity.

(*a*) Some evidence has been given in 8 (*f*). For summaries of data on the effect of treatment of I cases by I horse antiserum see (A) and Langley. I think we can take it as well established that a tested reliable serum, started early and given in large (100 cubic centimetres) repeated doses is efficacious—its use is of course not contra-indicated in late cases. Some sera on the market are useless (A).

(*b*) Cecil and Larsen tried serum antibody (against I, II and III) in 424 cases with controls. The results were good in I cases, less so in II and IV (so some cross protection). No effect was produced against III.

(*c*) The reported results of Kye's polyvalent fowl antiserum in repeated small doses (ten cubic centimetres) are good—summarized in (B). Continued use has confirmed this (Capps).

(*d*) Human convalescent homologous serum has been used with reported good results.

(*e*) Berger and Montgomery have reported benefit from intramuscular injections of chicken blood.

(17) Remarks on Immunity.

More evidence is needed and will probably soon be forthcoming, but meanwhile it is perhaps permissible to indulge in a little speculation.

(*a*) It is evident that in whole blood we have immunity reactions which differ, either in kind or degree, from those of serum alone, and possibly even from those of serum and leucocytes.

(*b*) The absence of strict parallelism between the protective power of serum, and the presence of agglutinins and opsonins on the one hand, and immunity on the other, suggests that blood plasma contains a very labile specific or non-specific substance, which may act directly on pneumococci as well as more energetically in combination with specific known antibodies. The double nature of many enzymes offers an analogy. Hektoen and Ruediger claimed that opsonins have a labile component (Zinsser c). Possibly such a substance is produced by leucocytes—for evidence of their extracellular action see Tongs, also Wright (1923) on epiphylactic response. Possibly leucocytes (or other cells) on receiving an appropriate stimulus have the power to modify specifically their normal secretions. Local cellular or tissue specific immunity is at present a "fashionable" probability, but there is no reason to exclude the cells of the blood from this idea.

(*c*) Whether clotting plays an important part (other than mechanical) in immunity against pneumococci still needs to be determined—important substances may be retained in the clot.

(*d*) The evidence under 14 (1) shows the need for caution in postulating tissue immunity, because we may possibly be dealing instead with unknown factors in whole-blood immunity.

(*e*) The testing of whole-blood immunity appears to be one of the most important tests of active immunity, and promises to become a standard test for vaccines. I suggest that similarly it be used to test the efficacy of antisera, by finding the degree of enhancement of the bactericidal power of whole human blood caused by the addition to it of measured quantities of a serum.

(18) Vaccine Treatment.

The late vaccine treatment of complications is too well recognized to need comment. Early treatment with vaccine has been well reported on by many observers, chief among whom are :—

(*a*) Wright and others (1914). Vaccination in the incubation period

appeared to abort an attack. A negative phase did not supervene with single doses of less than 1,000 million cocci.

(*b*) Raw (1912) reported benefit, particularly in the absence of complications. Dose from 100 to 150 million.

(*c*) Wynn (1915) reported good results from early treatment. Several attacks were aborted, although consolidation, etc., took its normal course. Stock untyped vaccine, virulence essential, primary or early cultures best.

(*d*) Wynn (1922). As above, good results in both lobar and bronchopneumonia were obtained by early treatment with polytype vaccine of virulent strains—forty-nine lobar cases treated within the first three days with only one death, and that in a labour case. The virulence of the strains used is said to be more important than typing. Dosage 100 million, repeated if necessary on each of the next few days. Once a 1,000 million given with good results.

(*e*) Malone's recent good controlled results (1924) were with homologous rabbit-grown vaccine, following a stock vaccine on the first day of treatment—18 treated within the first three days with 1 death, 17 untreated with 5 deaths. Dose 400 million on each three successive days. No general reaction to speak of.

(*f*) Lister (1924) reports good results from South Africa, and quotes good results by Girdwood. Dose recommended, 8,000 million cocci repeated once after twenty-four hours. Lister states he has given as much as 20,000 million intravenously to cases and apparently with benefit, despite the provoking of rigors.

(*g*) In dogs with a pneumococcal septicæmia the organisms diminished in numbers shortly after a living vaccine (Bull).

(*h*) Altered vaccines. Some workers—e.g., Rosenow and Falls—have reported benefit. Their use is usually accompanied by distinct general reactions which possibly may be due only to the large doses employed. It is to be noted that many users of ordinary vaccines in small or moderate doses have reported benefit—an early detoxication, without any particular rise of temperature, etc.

(*i*) *Foreign Proteins.*—Many have reported benefit from the use of typhoid vaccines, injections of milk, etc. As typical examples we may take: (1) Miller, who found that in 6 out of 15 cases detoxication occurred after an intravenous injection of 30 million dead typhoid bacilli. The initial general reaction bore no relation to the benefit received. (2) The action of nuclein injections in producing leucocytosis has recently been favourably reported on in pneumonia by Gardner Medwin. Large doses of sodium bicarbonate are said to have assisted.

(19) Remarks and Suggestions on Vaccine Treatment.

(*a*) Lack of controls with fewness of cases make sound conclusions impossible. Assuming that vaccines and non-specific proteins have been of some use, it would appear that the action of a vaccine in early treat-

ment is probably at least partially non-specific—the immediateness of the response is against specificity except that some sensitization may have already occurred. Wright's epiphylactic response (of leucocytes) appears to be mainly non-specific. In our present ignorance it is best to use specific vaccines, and for the same reason type-specific if possible.

(*b*) Immuno-transfusion seems indicated in cases not benefited at once by vaccines.

(*c*) Autohæmotherapy has not yet been sufficiently tried.

(*d*) *Dosage.*—Remembering the clinical picture of pneumonia, and seeing that moderate or severe general reactions following the injection of foreign proteins, including vaccines and specific antisera, are said to have sometimes had a bad effect, e.g., by Cecil and Larsen, I think it would be sound to lay down for the present that the treatment vaccine dose should be subreactional. Further, it should be the dose that yields the best response. This is impossible to decide without experiment and observation. The tendency in South Africa is towards two doses, or even only one early large dose. While I think it probable that two doses (with twenty-four hours between), each of 400 or 500 million pneumococci, given subcutaneously will be found to be as effective as larger doses, and to be free from general reactions, yet since individual idiosyncrasies occur, perhaps smaller doses of 200 or 300 million each would be advisable to begin with until experience with large numbers of cases is gained. I think only two doses would be best. Too small a dose may produce no results at all.

(*e*) The importance of early treatment cannot be too strongly emphasized. Signs of consolidation should not be waited for. No harm will be done if a few be treated for pneumonia when they do not have it, whereas late diagnosis and treatment will vitiate the trial of vaccines. When cases report or are diagnosed after the third day of illness, vaccine should not be given; these late cases should be recorded separately. Wynn's last article should be read by all using vaccines.

(20) Other Treatment.

(*a*) The necessity of not overfeeding and of using glucose to replace food by the mouth, given by other routes if necessary, has been emphasized by several. Burkitt reports that 255 cases of mixed pneumonias seen early have been treated without a death on his lines of initial purgation (plus bleeding if indicated), starvation except for glucose, hydrotherapy to keep the temperature below 101° F., alkalies plus much water. Crossman reports benefit from large repeated doses of tincture of garlic—half a drachm every four hours or so.

(*b*) Quinine and cinchona derivatives have a direct bactericidal action on pneumococci, but there is no good evidence that quinine in large doses is of use in pneumonia—my own clinical impression has been that cases treated by mistake as malaria in the first day or two with full doses of quinine did badly. Quinine in high dilutions stimulates phagocytosis, but

not in low dilutions, when it poisons leucocytes. (Kolmer, Solis-Cohen and Steinfeld.) Ethyl hydrocuprein (optochin) after trial in seventy-five cases is not recommended for the routine treatment of lobar pneumonia by Moore and Chesney. It follows that quinine is not indicated. I suggest that if given to prevent malarial relapses it should be very cautiously used, if at all, before the crisis, e.g., only in small doses in the first two or three days. After the crisis is another matter.

(21) The Preparation of Stock Vaccine.

(*a*) Types.—I suggest that these should be I, II and III plus the commonest IV type. Their relative proportions should be roughly, according to the local distribution prevalent, e.g., for North India I suggest two parts of I to one of each of II, III and of the commonest type of IV, as found by Malone.

(*b*) Virulence.—This is still a debated question. So far as the pneumococcus is concerned, most observers favour virulence in strains for the production of good antisera, e.g., Griffith in (B). This does not necessitate virulence for active immunity or for treatment—see Cole and Moore (B), though even here it has been insisted on, Wynn and others—but how much merely as an opinion, and how much as the result of experiments, is not recorded. Harvey and Iyengar's work suggests that generally virulence is not needed for producing active immunity. Cole and Moore point out that it is virulence for man that is wanted, so keeping stock cultures going on human blood or serum media with occasional animal passage might be of use, if there be any advantage in incorporating only virulent strains: for the maintenance of virulence see Gaskell.

(*c*) Constitution.—Ferry and Fisher have recently shown the antigenic importance of the filtrates of broth cultures and of the washings of pneumococci grown on solid media. Until more is known of antigens and immunity, it is probably best to use a whole unwashed vaccine made from organisms grown on solid media, to avoid the toxicity of the ordinary constituents of liquid media.

(*d*) Media.—Recent work by Avery, Morgan and Neill (1924) has shown that multiplication of pneumococci ceases from production of acid and of peroxides (probably $H_2 O_2$), and that the latter can be prevented by anaerobic growth or by the addition of fresh unheated animal or plant tissues—potato serves well. So the addition of sterile potato or other juice to suitable solid media, e.g., trypsinated meat agar, can replace the addition of blood or serum. The optimum pH is one of 7·8.

(*e*) The suspension liquid.—Recent work by Robertson and Woo, Sia and Oswald (D. 1924) has demonstrated that lysis is slower in Locke's fluid or in phosphate solutions than in normal salt solutions, and is slowest if 0·1 per cent gelatine be added. Lord and Nye have shown that the lysis of pneumococci and even solution in bile is due to enzymes. To what

extent autolysis alters important antigens is a problem demanding attention. Possibly the reported superiority of autogenous vaccines in many instances is due to their being fresher and less autolysed than stock vaccines.

(*f*) Sterilization.—Evidence is needed for the relative advantages of killing by heat and by antiseptics, and of various antiseptics such as formalin, phenol, etc., as preservatives for vaccines—the histological properties of formalin would seem to indicate its trial for vaccines. The prevention of autolysis should perhaps be one of the properties of a preservative.

REFERENCES.

(A) Glynn, Digby and Jones. Medical Research Council Report, 1923, No. 79.
(B) Eastwood and Griffith. Ministry of Health Report, 1922, No. 13.
(C) Avery, Chickering, Cole, Dochez. Monographs of the Rockefeller Institute, 1917, No. 7.
(D) *Journal of Experimental Medicine*, in list below :—

Avery and Morgan (D), 1924, xxxix, pp. 275, 289, 335.
Avery and Neill (D), 1924, xxxix, pp. 347, 357.
Barber (D),1929, xxx, pp. 569, 589.
Berger and Montgomery. *Journ. Amer. Med. Assoc.*, 1923, lxxx (2), p. 1176 abs.
Bloomfield and Felty (D), 1924, xxxix, p. 367.
Bull (D), 1916, xxiv, p. 7.
Burkitt. *Lancet*, 1921 (2), p. 630.
Capps. *Journ. Amer. Med. Assoc.*, 1923, lxxx (2), p. 1643 abs.
Cecil and Austin (D), 1918, xxviii, p. 19.
Cecil and Blake (D), 1920, xxxi (*a*), pp. 403, 445, 499; (*b*), pp. 657, 685.
Cecil and Larsen. *Journ. Amer. Med. Assoc.*, 1922, lxxix (I), p. 493.
Cecil and Steffen (D), 1921, xxxiv, p. 245; (D) 1923, xxxviii, p. 149, U.S.A. Public Health Reports, 1922, xxxvii, No. 44.
Cecil and Vaughan (D), 1919, xxix, p. 457.
Chickering (D), 1914, xx, p. 599.
Clough, Mildred (D), 1919, xxx, p. 123.
Clough, P. *Journ. Amer. Med. Assoc.*, 1919, lxxiii (1), p. 785 abs.
Cole and Moore (D), 1917, xxvi, p. 537.
Crossman. *Brit. Med. Journ.*, 1924 (I), p. 519.
Felton and Dougherty (D), 1924, xxxix, p. 137.
Ferry and Fisher. *Brit. Journ. Experi. Path.*, 1924, v, p. 185.
Gardner, Medwin. *Brit. Med. Journ.*, 1924 (*a*), p. 49.
Gaskell. *Journ. Path. and Bact.*, 1924, xxvii, p. 253.
Gordon. *Journ. Infect. Dis.*. 1921, xxix, p. 437.
Hall, Stone and Simpson. *Journ. Amer. Med. Assoc.*, 1918, lxxi (*a*), 1986.
Harvey and Iyengar. *Indian Journ. Med. Res.*, 1921-22, ix, p. 730.
Heist and Solis-Cohen. *Journ. Immunology*, 1918, iii, p. 261; 1919, iv, p. 147.
Hirsch and McKinney. *Journ. Amer. Med. Assoc.*, 1918, lxxi (2), p. 1735.
Jones (D), 1924, xxxix, p. 725.
Kolmer, Solis-Cohen and Steinfeld. *Journ. Infect. Dis.*, 1917, xx, p. 333.
Kolmer and Steinfeld. *Journ. Infect. Dis.*, 1917, xx, p. 344.
Kolmer and Weiss. *Journ. Immunolgy*, 1918, p. 395.
Keys. *Journ. Infect. Dis.*, 1916, xviii, p. 277; *Journ. Med. Res.*, 1918, xxxviii, p. 495.
Langley, *Lancet*, 1924 (1), p. 11.
Lister. *S. African Inst. Med. Res.*, 1913, "Specific-Serological Reactions (Pneumococci)," 1916, No. 8; 1917, No. 10.
Lister and others, 1924. "Discussion on Pneumococcal Vaccine." Reprint from *S. African Med. Record*, 1924, March and April.
Lord and Nye (D), 1922, pp. 685-705.

MALONE. *Indian Journ. Med. Res.*, 1922-23, x, p. 1144 ; 1923-24, xi (*a*), pp. 867, 877 ; (*b*) p. 947 ; 1924-25, xii, p. 105.

MAYNARD. Memoir S. African Inst. Med. Res., 1913, No. 1.

MILLER. *Journ. Amer. Med. Assoc.*, 1920, lxxiv (2), p. 1598, abs.

MOORE and CHESNEY. *Journ. Amer. Med. Assoc.*, 1918, lxx (2), p. 1892, abs.

PERMAR. *Journ. Med. Res.*, 1923, xliv, p. 1.

RICHARDSON. *Journ. Amer. Med. Assoc.*, 1919, lxxii (1), p. 863.

ROBERTSON, SIA and WOO (D), 1924, xxxix, p. 199.

ROBERTSON and SIA (D), 1924, xxxix, p. 219.

ROSENOW and FALLS. *Journ. Amer. Med. Assoc.*, 1916, lxvii (2), p. 1929.

SMILEY. *Journ. Infect. Dis.*, 1923, xxxiii, p. 88.

STILLMAN (D), 1917, xxvi, p. 513 ; (D), 1923, xxxviii, p. 117.

STRYKER (D), 1916, xxiv, p. 49.

TONGS. *Journ. Infect. Dis.*, 1922, xxx, p. 323.

TRUCHE. *Annales de l'Inst. Pasteur*, 1920, xxxiv, p. 98.

URQUHART. *Lancet*, 1921 (1), p. 1313.

WRIGHT, MORGAN, COLEBROOK and DODGSON. *Lancet*, 1912 (2), p. 1701 ; 1914 (1) pp. 1 and 87.

WRIGHT, COLEBROOK and STORER. *Lancet*, 1923 (1), pp. 365, 417, 473.

WYNN. *Brit. Med. Journ.*, 1915 (1), p. 458, *Lancet*, 1922 (2), p. 893.

ZINSSER and RUSSELL. "Text-book of Bacteriology," 1922 (*a*), p. 448 (*b*), p. 476, (*c*), p. 339.

A CORRESPONDENCE CIRCLE.

XVII.

MECHANICALIZATION AND THE MEDICAL SERVICES.

By Major M. B. H. Ritchie, D.S.O.
Royal Army Medical Corps.

A correspondent, writing about the question of mechanical transport of field ambulances, points out that there are two schools of thought on the employment of mechanical transport. One school considers that all mechanical transport should be under R.A.S.C. specialists, and if this were done it would break up our first line transport. The other considers that mechanical transport should be under unit control, and the Royal Artillery are striking out for control of tractors and tractor-drawn batteries.

"The difficulty of accommodating the mechanical transport of a division to the pace of infantry and horse transport is insuperable. The range of movement of these fast-moving vehicles is so much enlarged from the three-ton lorries on solid tyres that we must alter our views. You can do some good work here by the Circle. Personally, I cannot see how any mechanical transport ambulances will ever be allowed in an infantry column or between advanced guard and main body. Even if the gap is two miles it is a concertina space which must fill up if the advanced guard is checked by enemy action. Advances by bounds of mechanical transport vehicles is not a practical measure in a division."

Anyone interested in the question would do well to read an excellent article in the March, 1925, number of *The Fighting Forces*, entitled, "The Divisional Supply Column." Written by a R.A.S.C. officer, it presents the view of the problem as seen by that Corps. He advocates the formation of a supply battalion, in eight sections, the seventh of which is ambulance, and he emphazises the fact that transport and distribution services in the divisional area forward of railhead must be under the control of one combatant officer—"Specialist doctrinaires and men of formulæ are not suited to military administration, which is not wholly a question of logic."

As regards the medical units, the article states: "The carriage of sick and wounded is carried out now by separate units manned partially by one branch and operated by another. This is inevitable and affords some excuse for the allegation that ambulances always carry combatant and fit personnel. The unit is attached to a parent company for reinforcement and repairs, and it seems but logical to regard it as part of one of the train companies. That it operates away from the company continuously is not a sound argument in favour of its permanent detachment, though the attachment of three field ambulances to an existing company is clumsy."

In view of the above, we would do well to give the matter of ambulance transport our attention, and one would like to see the case for the medical services stated as lucidly as that for the R.A.S.C. In the late war we looked upon the R.A.S.C. personnel of medical units as part and parcel of them, but this is not the view of that Corps.

The medical services throughout its history has suffered from lack of autonomy, or from other services being partially responsible for its work. In war you cannot get away from the soundness of running your own show. You are paid to do it, and no one can do it better than you, if you are left alone. "I must have things in my own hands and run my own show"—every great soldier and administrator has acted on this principle. Why our ambulance transport is not R.A.M.C. personnel, and never has been, is because we do not have autonomy. Read Army Medical Reports for 1871 and you will find a report on a field hospital on manœuvres, in which the transport animals were taken away every evening and sent back next morning. My personal opinion, if I may be allowed to express it, is that we cannot attain our highest degree of efficiency until we get control of the medical service in war into our own hands, though this means much extra work, the creation of a new type of responsibility and the overcoming of a vast deal of opposition. We must attain a new view-point—one from which the powerful influences of organized medical science upon success or failure in war is clearly demonstrable—and we must get those who are concerned in questions of Imperial Defence to climb up there, look around, and *understand.*

Once more I say that this is no matter of "departmental aggrandizement." Autonomy is imperative, and will come in due course, I feel, because it is the simplest way of obtaining medical efficiency in war. In any future war in which the Empire may be involved, autonomy in the medical services means that the manhood of the nation—our descendants—will be skilfully attended and the armed forces of the Empire saved from the ravages of preventable disease. Lack of autonomy leads towards lack of service enterprise, *laissez faire*, the quest for the scapegoat and the setting up of the customary Royal Commission.

To revert to the question of mechanicalization as it concerns the medical services, we must begin to develop definite views upon this vital subject, and frame an unofficial policy. The motor is to the army what the aeroplane is to the navy, and one cannot help feeling that there is a tendency to attach too much importance to the control, maintenance and driving of the mechanical transport being done by the specialist. Is all this organization really necessary? In other words, when that noble creature, the horse, dominated the minds of those who organize armies, a medical officer brought his horse along with him and he was allowed to ride it himself without let or hindrance. His servant, who probably knew less about horses than the modern soldier knows about motors, did groom, and did the job well. Now, why cannot a doctor who mobilizes for active

services bring a Ford or a stink-bike with him and run it himself? This is a point that is difficult to understand. He possesses some form of motor conveyance that has carried him over country roads night and day; he knows how to drive and how to carry out running repairs; he is probably a better mechanic and better driver than the enlisted chauffeur, for most doctors have good "motor hands." Yet, when he goes to war he is either denied a motor vehicle or else he is given part use of a chauffeur-driven car.

Thus, in the consideration of the mechanical transport problem in war, I venture to suggest that the existence of the owner-driver, now ubiquitous, has not been fully realized. Applying this to the medical services, the control of all cars in the hands of one Corps only is analogous to ringing up a garage and hiring a car when you want it; this system has decided drawbacks. To give our service its own transport is like keeping your own car—the only efficient method. A doctor in practice must keep his own car, which he drives himself or employs a chauffeur to do so. What he wants is a convenient garage where he can have his repairs done. To a doctor and to a medical unit, the hiring system is impossible; it is not only an expensive system, but it is an inefficient system. But we shall have it in the next war unless we begin to think about the mechanicalization problem ourselves and put our views forward.

Editorial.

MOBILITY IN MODERN ARMIES.

Several very interesting papers on this subject have recently appeared in the *Army Quarterly, Fighting Forces,* the *R.A.S.C. Journal* and other periodicals. Military writers emphasize that the aim of modern generalship is liberty of action, which is secured by three great tactical forces—the power to hit, to guard, and to move.

Railways are a great help strategically, but cannot assist much in the actual deployment on the field of battle.

The distinguishing feature of the late war was the petrol engine: at the commencement of hostilities we had 200 petrol-driven vehicles and at the Armistice 118,000.

One of the first efforts at mechanicalization was when General Galliéni used 4,000 taxi-cabs to convey troops in support of General Manoury's sixth army, and motor-buses conveying troops were common features behind our lines in France. Motor-lorries were also used for the conveyance of shells, stores, etc., and tractors were employed to move heavy guns.

At present, however, soldiers appear to be thinking of a mechanicalized force composed of infantry, artillery and tanks. The French are developing mechanicalization: one of their ideas is to form a *division legère automobile.* Certain cavalry divisions have been converted into light mechanical divisions consisting of cavalry, artillery and infantry carried in motor-lorries, and armoured cars. On the outbreak of hostilities the light divisions will move forward as advanced guards; the main body of troops in the rear will be carried in lorries which will be guarded by flank guards of cross-country machines, tanks or tracked armoured cars. If the mechanicalized light divisions can penetrate the enemy's front to a depth of 100 miles within a few hours of the declaration of war, it is thought that mobilization of the enemy forces will be seriously affected. The light divisions will have to live on the enemy country until their own more slowly mobilizing infantry can close up behind them. They will have to be ready to move at a moment's notice and administrative units will be convoyed by mechanicalized troops.

It is also considered possible that a rapidly moving mechanicalized force might prove of great assistance during enemy air raids by capturing the ground organization of an air force before this had succeeded in destroying the *moral* of civilians in the administrative centre of the country raided. It is calculated that the mobility of an air force is from 150 to 300 miles according to the machines employed, but if its ground organization has to be moved in lorries under war conditions the daily

increase in range of the force may be limited to 100 or even 50 miles. It is unlikely that an ordinary infantry force could prevent an enemy air force from effecting its object of destroying the *moral* of the civil government: a mechanicalized force might save the situation.

A few blow holes or broken bridges would stop a force carried in ordinary lorries; moreover, a mechanicalized force confined to roads is very vulnerable to air attacks. The road thus becomes the governing factor of mobility and must be dispensed with by the use of tracked or cross-country vehicles. Tracked machines have already accomplished journeys of over 3,000 miles across country at an average speed of 130 miles a day.

The 3-ton lorry with solid tyres can only be used on roads but a 30-cwt. lorry with giant pneumatic tyres can get over difficult ground which is quite impracticable for machines with solid tyres. The drawback to the giant pneumatic is its first cost, but its service compensates for the increased expenditure.

In 1925 demonstrations were given at Aldershot of a Hathi tractor, a Renault six-wheeled 30-cwt. subsidy type of lorry, a 15-cwt. tender, and a water-tank (160 gallons) trailer. The Hathi tractor can cross uneven ground and negotiate a ditch; the Renault lorry can travel on roads at rates varying from 2·4 to 13·4 miles per hour, and across country at 2·4 to 8 miles per hour. The 15-cwt. tender is typical of the smaller road carrier required for goods or ambulance purposes. The 160-gallon water-tank trailer is intended to supply water for troops carried on mechanicalized units. It is fitted with a pump for filling the tank from any available stream, also with a clarifier. The water is drawn off from taps at the rear of the trailer, and can be sterilized by treatment with chlorine or chloramines.

In the manœuvres last year the mobile force of the Wessex Commander, owing to its composition, did not attain the mobility which the directing staff anticipated. It is now clear that horses must be eliminated from a mechanicalized column: this necessitates mechanicalization of first-line transport. Troops must be carried in homogeneous and efficient vehicles, and careful reconnaissance of all country and available roads must be made not only by commanders, but also by R.A.S.C. officers well versed in the inherent difficulties of mechanical transport. A mechanicalized or tractor-drawn unit cannot be used unceasingly. The crews of the vehicles are human, and the strain of driving is often greater than that of marching, and troops carried in motor-waggons may be almost as much exhausted from the combined effects of cold and petrol fumes as if they had marched.

In his speech on March 15, 1926, when introducing the Army Estimates, the Secretary of State for War said that the future of mechanicalization was full of difficulties which must be gradually studied before any definite policy could be reached.

Horses must be eliminated from mechanicalized columns. Until a

satisfactory type of machine could be evolved which had commercial possibilities the cost of mechanicalizing large forces would certainly prove prohibitive. There was no vehicle in general commercial use which met army requirements.

This point has been stressed by many writers on mechanicalization. The replacement of man and animal by a machine is sound in land warfare, but it is upon the proportion of the replacement that opinions differ. The knotty problem is how far we should carry the process of mechanicalization. We must be able to apply the equipment of our daily life to the necessities of war. The tracked vehicle is not a commercial implement at present, but such a vehicle would be very useful in our colonies where roads are few. We can also imagine that at home a lorry which could go straight to the crops over any kind of ground and deliver direct to the retailer or consumer would save both time and money.

When a force is completely mechanicalized the difficulties mentioned by Major Ritchie's correspondent do not arise. The idea is to have vehicles of as uniform type as possible, so as to maintain a regular pace without strain on the machines. The mechanicalized columns will have to be self-maintained for varying periods and uniformity of type is essential, as the carriage of spare parts must be reduced to a minimum.

When motor transport of the ordinary type used in the late war is associated with marching columns difficulties as regards pace must arise, but it seems not unlikely that a motor vehicle capable of proceeding at two to three miles per hour without undue strain on the engine will soon be available. In any case the type selected will have to be one employed in civil life and for which large manufacturing centres already exist. A mechanicalized force confined to roads is an impossibility under conditions of modern warfare and cross-country vehicles are absolutely essential.

During the 1st Divisional Exercises carried out in August, a trial was made with the Morris six-wheeled motor lorry and with larger lorries on the Kegresse (semi-track) principle; both vehicles did well and negotiated deep mud. The six-wheeled vehicle was more comfortable for the troops, did not destroy the road surface so much and when not tracked was quicker on the roads.

The rate of movement of the infantry was increased by taking 6 to 7 lb. off the man and transferring this load to the fast-moving mechanicalized vehicles.

"Embussing" infantry was found more suitable for strategical than for tactical movements. The chief difficulty was the carriage of horses and mules without which infantry at present cannot function in the field. For tactical purposes, if infantry are moved in motor vehicles it appears essential to mechanicalize completely the first line of transport.

While infantry continue to march, the tendency seems to be towards the provision of mechanicalized cross-country vehicles for (1) machine guns, and

(2) for the Lewis guns used for anti-aircraft work, and also to make use of a mobile vehicle for divisional and brigade headquarters and for report centres. Whether they have mechanicalized vehicles at their disposal or not, brigade, battalion and even company commanders still seem to regard horses as essential for cross-country reconnoitring. Mechanicalized vehicles can bring the machine guns of a brigade or a unit to a certain rendezvous, but the best positions for the guns can be most quickly discovered by mounted officers.

In September, tests were carried out at Weaver's Down, near Liphook, with a number of the Morris six-wheeled motor lorries, which were used in the Aldershot Divisional Exercises. On arrival at Weaver's Down the vehicles were fitted with the adjustable metal tracks, which couple the two pairs of rear driving wheels, and were then tested on gradients of from 1-3 to 1-2·2, and on surfaces varying from loose sand to heather. The ascents and descents were made successfully, and bog land and soft sandy patches on the flat were negotiated without help. For ditches, light collapsible wheel-track bridges, carried on the lorries, were used, and these obstacles were crossed without much difficulty.

On October 12, a further demonstration was given by the experimental branch of the R.A.S.C., with a column of six-wheelers over broken ground to the east of Chobham ridges and across the manœuvre area that stretches between the Basingstoke Canal, east of Frimley and the Normandy-Pirbright road. Over heather the column climbed gradients of 1 in 3½, took hairpin bends on a loose surface of sand, turned corners on a slope that tilted the lorry 30 to 35 degrees out of the perpendicular, and trundled through marsh and bog. In the column there were twelve Morris six-wheeled light lorries, a Morris six-wheeled motor car, two Thornycroft medium six-wheelers and a Guy and a Karrier of similar type. All the lorries are capable of carrying three tons on the road and two tons across country. The Morris six-wheeler lorry is now being produced commercially for sale in the Dominions and at home; it can average thirty miles per hour on the road and slow down to the pace of infantry. The Morris six-wheeled motor car has been designed to serve the G.O.C. of a division or corps for reconnaissance, and as it travelled wherever a horse might go, it seems likely that it may combine the duties now distributed over a car and a charger.

Looking into the future one may see :—

(1) A completely mechanicalized striking division making a dash into enemy country for a specific purpose, but as the division advances there may be enemy forts left unreduced, or centres existing from which enemy forces may raid the country between the attacking division and the main force mobilizing more slowly in its rear. In these circumstances wounded men will have to be left under the Red Cross or be taken with the advancing division and then sent back to the main army by aeroplane or in convoys, guarded by mechanicalized troops, as opportunity offers.

(2) A large army with its transport suitably mechanicalized for cross country work. Such a force would be able to move away from roads, but would require expert drivers with a knowledge of map reading and an eye for country. From the medical point of view it would be essential to secure a vehicle in which wounded could be carried in comfort and a type such as the six-wheeled vehicle has been suggested as likely to meet medical requirements. The drivers of the R.A.M.C. vehicles would have to be trained by the R.A.S.C., but on the outbreak of war they should be handed over to the D.M.S. for employment as required with medical units. Light front-line repairs could be carried out by these trained men, and each field ambulance and motor ambulance convoy would probably be provided with a repair wagon carrying the necessary outfit.

In the circumstances we have visualized there would be no place for the ordinary car and doctor-driver, except possibly at bases and on the lines of communications. Beyond railhead special transport and highly-trained drivers would be required.

The special medical problems in front of railhead associated with a mechanicalized army require to be thought out, and some assistance is given by the experiences in the advance to victory during the late war. It was then noted that C.C.S.s were much further back than in previous battles, and this difficulty was accentuated by the rapidity of the advance, which is likely to be even more marked when an army is mechanicalized and the fighting troops carry less weight. During the advance ambulance trains ran with less regularity, and at times there were long gaps between the more advanced medical units and the nearest railhead.

The railheads did not advance as rapidly as the troops, and the question arose whether it was best to push C.C.S.s in advance of railheads and have two stages of road transport through C.C.S.s to railheads, or to retain the C.C.S.s at railheads only and bring the wounded back by one long road journey on cars. "As a rule the latter alternative was adopted, but in that case advanced operating centres were established either in field ambulances or in advanced C.C.S.s for urgent cases and for those unfit for long road transport." The care of wounded enemy prisoners, and possibly the medical charge of sick civilians in towns and villages, had also to be considered when estimating the medical requirements. C.C.S.s were sometimes allotted for the care of civilians alone.

During the advance to victory damage to roads prevented the motor ambulance convoys from working rapidly and uninterruptedly, but it is probable that the convoys when mechanicalized would be able to move more freely. The carriage of severely wounded men in motor vehicles across country is not to be lightly contemplated, but this would probably be for only comparatively short distances where roads were destroyed.

Following on the advance of the 2nd Army beyond Messines and the Paschendale ridges there was a wide area of devastation between the divisions of the Army and the C.C.S.s, and transport of wounded was

extremely difficult. Wounded had to be carried long distances by hand to main dressing stations.

During the September operations of the 2nd Army, advanced dressing stations were merely collecting posts at which wounded were loaded on wheeled conveyances for transport to the dressing station.

There would be no horse transport with an army completely mechanicalized, and long carriage by hand being very exhausting, wheeled stretcher carriers would be a great help in bringing the wounded from the regimental aid posts to the collecting posts, or advanced dressing stations, where the motor transport from the field ambulances would assemble and carry the wounded to the main dressing stations, reinforced with surgical teams for the treatment of urgent cases. From the main dressing stations cases capable of transport would be carried to the C.C.S.s at railhead. The walking wounded station, if formed, would be in the neighbourhood of the advanced dressing station and wounded would be carried by motor lorries straight to the C.C.S.s.

Normally the A.D.S. is supposed to be about two miles from the R.A.P.s, and this is quite far enough for hand or wheeled stretcher carriage; the M.D.S. about three miles behind the A.D.S. and the C.C.S. about five miles from the M.D.S. But if the advance were twenty miles, which is quite possible with a mobile army, then the wounded would have to be carried about fifteen miles by the motor ambulance convoys to reach the C.C.S.s. Motor ambulances in the late war travelled about six miles per hour, and seriously wounded men would have a journey of from two to three hours from the M.D.S. to the C.C.S. It would probably be advisable to have a rest station about half way, formed by the light sections of the C.C.S., so that severe cases could receive attention should this be found necessary.

If the advance continued for a few days the light sections of the C.C.S.s would be moved up and take over the wounded in the M.D.S.s, which would then move forward with the troops.

The employment of the C.C.S.s in echelon and grouping them in pairs or threes, as suggested in R.A.M.C. training, would have obvious advantages in the case of a rapid advance accompanied by many casualties.

Motor ambulance convoys would also be required for evacuating C.C.S.s, strung out in front of railhead, which would advance slowly at first and be subject to considerable pressure for the supply of food and ammunition to the troops.

We have put forward these elementary, and we fear rather crude, remarks in the hope of stimulating some of our contributors to write in detail on the medical arrangements likely to be required for an army with mechanicalized transport, operating both in a friendly and in an enemy country, in advance and in retreat.

Clinical and other Notes.

SUBCAPSULAR RUPTURE OF THE SPLEEN WITH DELAYED INTRAPERITONEAL HÆMORRHAGE. "BILHARZIASIS."

By SYDNEY SMITH, M.D., D.P.H.
Principal Medico-legal Expert, Egyptian Government Service.
AND
Major W. R. O'FARRELL.
Royal Army Medical Corps.
Professor of Pathology, Egyptian University, Cairo.

History.—A quarrel took place between two male attendants in a hospital on a Monday at about 3 p.m., and, though several blows were struck, neither of the combatants appeared to be any the worse immediately after the fight.

The men worked as usual during Tuesday without incident, but one of them, having complained of pain and diarrhœa during the night, was admitted to hospital on the following morning.

On examination by the house officer, there was no external evidence of injury, the pulse and temperature were normal, but pain and tenderness were noticed in the left epigastric and hypochondriac regions. There was no rigidity of the abdomen, which moved with respiration. A diagnosis was made of gastritis, and treatment suitable for this condition was adopted.

The patient's condition remained unchanged for the two succeeding days, but on the third day (Saturday) it became suddenly worse. On the following morning his condition was as follows: temperature normal, pulse 108 and moderately strong, abdomen distended, slight tenderness over the epigastrium with absolute constipation and no passage of flatus.

In view of the changed condition a diagnosis of intestinal obstruction was made, and an immediate operation was decided upon.

On opening the abdomen, about 400 cubic centimetres of blood were removed from the peritoneal cavity. As the source of this hæmorrhage was observed to be a rupture in the spleen, this organ was removed. The patient died the same day.

A post-mortem examination was performed the next morning. No external signs of violence were found. The abdominal cavity contained about 350 cubic centimetres of mixed blood and serum. The spleen was found to have been completely removed except that fragments of its tissues remained attached to the peritoneum. There were no signs of bruising about the tissues adjacent to the spleen, but a bruised area, two inches in

diameter, was found behind the cæcum and the lower part of the ascending colon.

The liver was in a state of advanced cirrhosis, characteristic of bilharziasis.

The stomach and intestines appeared normal. The kidneys were the site of interstitial nephritis and there was evidence of bilharziasis of long standing in the bladder.

There was nothing of importance to note in the other organs or tissues.

The spleen was found to have been broken into two pieces during the operation. It was enlarged (weighing 650 grammes) but not friable. Owing to the fact that firm peritoneal adhesions had to be broken down to permit of removal of the organ, the capsule was much lacerated.

On section an extensive subcapsular clotted hæmorrhage, about one

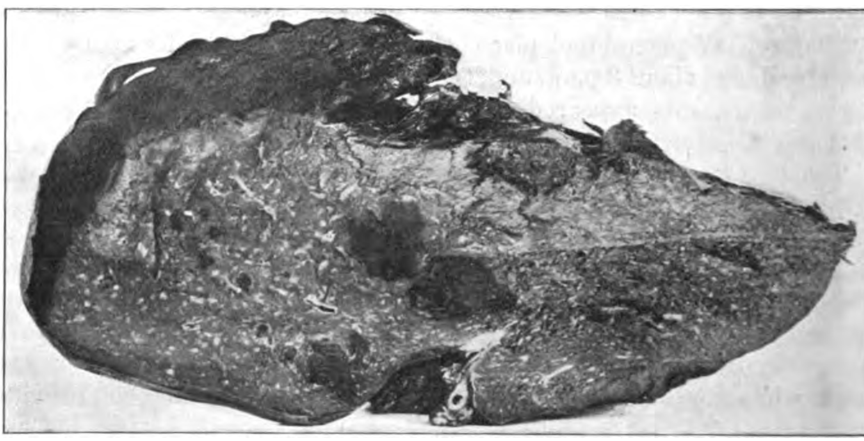


FIG. 1.

centimetre in thickness, was observed beneath the capsule on the external surface, while, towards the lower pole, there were three large circular hæmorrhagic areas extending through the splenic substance and which appeared to the naked eye as definite solid stems (fig. 1).

On microscopic examination these hæmorrhagic areas proved to be extravasations of blood which had followed, more or less, the course of the splenic sinuses.

The whole spleen was in a congested condition and showed a great increase of the trabeculæ and fibrous tissue. Apart, however, from generalized fine fibrosis, the pulp was apparently normal. In spite of the fine fibrosis displayed, the free vessels at the hilum showed no evidence of thickening. In numerous areas there were extravasations of blood which in places had clotted though this had not occurred in their more central portions. These areas were fairly sharply defined from the splenic substance

but there was no sign of attempted repair and, on examination under the higher powers of the microscope, it was found that the sharply defined contour was only apparent, red cells having spread into the surrounding tissues.

Round the areas of hæmorrhage much pigment was observed in the phagocytic cells. This pigment had arisen from the extravasated blood, there being no evidence of malaria although search was made for the parasite.

In certain areas groups of bilharzial ova of the terminal-spined variety were found, some of which showed a partial calcification whilst all were surrounded by an area of reactionary fibrosis (fig. 2).

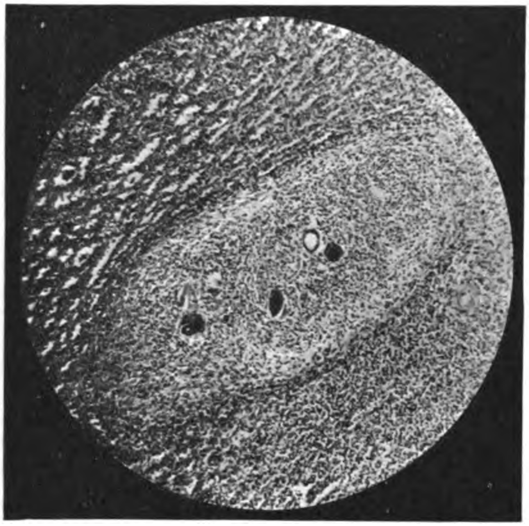


Fig. 2.

Throughout the spleen there were numerous eosinophil cells, but these were particularly numerous round the collections of ova. No giant cells could be found in these situations. In spite of careful examination, no definite fibrous nodules could be found which could be attributed to the irritation caused by bilharzial ova which had subsequently become absorbed. In the liver there was the "pipe-stem" periportal cirrhosis, which is so frequent in old-standing bilharzial infection, characterized by dense fibrosis of the portal areas surrounding islands of liver cells and the formation of numerous accessory bile ducts. In the cirrhosed areas bilharzial ova, many of which were calcified, were found.

Throughout the organ pigment had been deposited, more especially in the peripheral areas of the lobules. This condition was again not due to malaria.

The bladder was severely infected with bilharzia ova and a photomicrograph of its wall displays the degree to which the infection may reach in such a case (fig. 3).

Discussion.

This case presents certain features of both pathological and medico-legal interest.

In the first place, rupture of the spleen, though frequent in malaria, is relatively rare in bilharziasis. Demonstration of bilharzial ova in the pulp of the spleen is not unattended with difficulty, and therefore a definite diagnosis of splenic bilharziasis can rarely be made, though Egyptian splenomegaly is usually due to this disease.

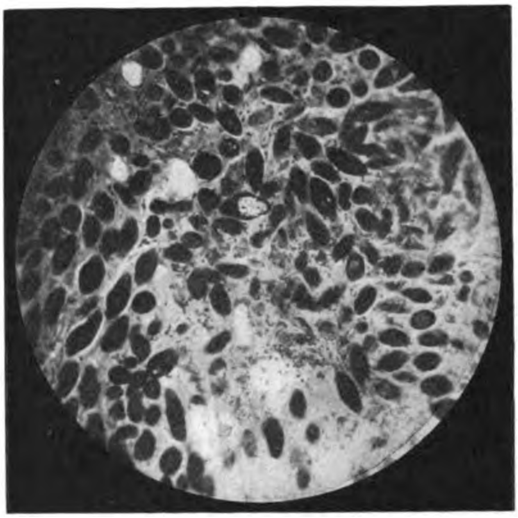


Fig. 3.

The discovery of ova of the terminal-spined variety is a further feature of interest, for it is usually understood that this variety does not infect the spleen.

There appears to be no doubt that death in this case was due to the rupture, by violence, of a spleen already the seat of bilharzial disease, while, from the bruising of the tissues about the cæcum, it may be deduced that more than one blow was received in the abdomen.

The violence applied to the spleen caused a rupture of the parenchyma but not of the capsule. A hæmorrhage occurred in the substance of the organ, gradually increasing in size, till the blood reached the capsule, under which it spread until the resulting pressure became sufficient to cause a further rupture into the peritoneal cavity.

It is further of interest to note that for about thirty-six hours after the injury had been sustained the victim was able to carry out his ordinary work, while no serious symptoms arose until a further eighty-four hours had elapsed.

The probability is, therefore, that the blow caused a rupture of a small vessel only in the spleen, with consequently but little hæmorrhage during the earlier period while the man was at work. The hæmorrhage gradually increased, and at the end of thirty-six hours sufficient pressure was exerted by it to cause pain and distress. On the other hand, a further three and a half days elapsed before sufficient pressure was exerted to cause a rupture of the capsule.

In this case the violence applied appears to have been by no means considerable, and under other circumstances the history of this injury might not have been elicited, and in consequence the case recorded as one of spontaneous rupture. The authors feel that, in a great many of the recorded cases of so-called spontaneous rupture of the spleen, the initial cause has been the application of external violence, and that spontaneous rupture of a spleen, whether healthy or enlarged, does not occur.

A point of clinical importance in this case is the fact that acute pain or other localizing features were entirely absent, this no doubt being due to the fact that the primary rupture took place within the substance of the organ.

A CASE OF ? GASTRIC SYPHILIS.

By Major J. H. M. FROBISHER.
Royal Army Medical Corps.

AND

Captain J B. FOTHERINGHAM.
Royal Army Medical Corps.

The patient, aged 39, a warrant officer, was admitted to the Military Hospital, Gibraltar, complaining of chronic constipation and of anorexia, associated with a sense of fullness in the epigastrium after meals, of six months duration. He also complained of occasional attacks of nausea rarely associated with vomiting. There was no history of hæmatemesis, and no history of alcoholism or venereal disease was admitted. He had not been losing weight.

His appearance was that of a chronic dyspeptic, and on admission to hospital his tongue was heavily furred, his breath offensive and there was some degree of ptyalism. Patient had an imperfectly fitting denture but his oral hygiene was fair. There was slight tenderness over the whole epigastrium on deep palpation but epigastric pain had apparently never been a feature of his illness. At first nothing abnormal could be discovered in chest or abdomen and his condition was considered to be one of chronic

gastritis. However, as the patient did not improve under treatment, and as his ptyalism became markedly worse, investigations were carried out to exclude the possibility of ulcer or neoplasm.

Test Meal gave the following result:—

Free HCl	..	..	0·124 per cent.
Combined HCl	..	..	0·127 ,,
Organic acids	..	..	Trace
	Total acids	..	0·251 ,,

A mere trace only of lactic acid was detected in the test meal and blood was not present. It is suggested that the patient's marked ptyalism lowered the percentage reading of the total acids.

Fæces.—No blood or occult blood detected in the fæces.

Barium Meal.—The result of this examination showed great delay in emptying of the stomach, and an apparent "filling defect" on the greater curvature near the cardiac orifice.

In addition the radiogram showed a peculiar appearance in the splenic flexure (*vide* radiogram) about which we are unable to express an opinion. The apparent "filling defect" made us consider the possibility of new-growth, ulcer, or gumma.

Patient's blood was then sent for a Wassermann test and the result was strongly positive. In view of this and the radiological appearances, a provisional diagnosis of "Syphilis" of the stomach was made, and patient was put on antisyphilitic treatment.

A total of 3·62 grammes sulfarsenol with large doses of potassium iodide, and a short course of mercury by the mouth was given.

As was anticipated, the specific treatment increased the ptyalism and this was controlled to a great extent by the administration of tinct. belladonnæ fifteen m. t.d.s. and an astringent mouth wash.

His ptyalism is difficult to explain and no local cause could be found to account for it, but it was a marked feature of the case and was not an hysterical manifestation. The antisyphilitic course was given over a period of three months. At the end of this his Wassermann reaction and Sigma test were both negative. Equally important, the patient had lost all his dyspeptic symptoms and a further radiological examination showed that a great change had apparently taken place in the stomach.

Prior to the antisyphilitic course the patient was very sluggish mentally. His pupils reacted to light and accommodation and his fundi were normal. Romberg's sign was not present. Knee-jerks were a little exaggerated, gait normal, but patient had a little inco-ordination, well shown when he tried to button or unbutton his jacket. In addition he had throughout his illness difficulty in opening his mouth widely, and had more control over the left side of his face than the right. At all times there was an almost mask-like immobility of his face. At the end of his specific course patient was distinctly more alert mentally, but his face remained immobile, a

slight degree of ptyalism was present, and there was still difficulty in carrying out fine movements with his hands. According to one of his officers who had known patient for five months, this facial expression had not altered, but the patient's wife informed us that about six months prior to his admission to hospital he gradually began to take no obvious interest in his family or affairs, and that he gradually cultivated the habit of sitting in a chair staring somewhat vacantly into space. It is of interest to note that patient has five children ; the three older children are healthy but the two youngest, who are twins, closely resemble congenital syphilitics. It is considered that the patient had probably a very slight degree of cerebral syphilis prior to his admission to hospital. He had now been transferred to England for further treatment.

Finally, we should like to call attention to the article by L. T. Le Wald (*Radiology*, Feb., 1926, p. 138) in which he maintains that a radiological examination affords the best means of recognizing the existence of syphilis of the stomach, and that antisyphilitic treatment under radiological supervision should always be employed in cases where there is any doubt as to the diagnosis, or where malignancy is believed to be present and so advanced as to render operation impracticable.

In regard to the interpretation of this case both clinically and radiologically, we are open to correction, but if our deductions are correct the case is one of considerable interest.

[Note.—At the request of the authors we have referred this paper to Major McGrigor, X-ray Department, Q.A.M. Hospital, Millbank, for his opinion. Major McGrigor states that from his experience of cases of syphilis of the stomach he thinks the clinical and radiological deductions of the authors are correct.—Ed.]

NOTES ON THE SCHICK TEST AS CARRIED OUT AT THE DUKE OF YORK'S ROYAL MILITARY SCHOOL, DOVER.

By Major F. E. ROBERTS, D.S.O.
Royal Army Medical Corps.

AND

Major F. CASEMENT, D.S.O.
Royal Army Medical Corps.

Owing to a small outbreak of diphtheria at the Duke of York's Royal Military School early in 1926 it was decided to carry out the Schick test on the boys of the Junior School, and it is thought that the technique and results may be of interest.

The Junior School consisted of ninety-one boys, of whom six were absent in hospital when the test was performed.

Technique of Test.

Schick capillary sets, consisting of toxin in a capillary tube, diluting fluid in a ten-cubic-centimetre bottle, and already diluted and heated toxin in a ten-cubic-centimetre bottle as a control were obtained from Messrs. Burroughs Wellcome and Co.

One cubic centimetre Agla all-glass syringes graduated in one-tenth of a cubic centimetre, with special very fine rustless steel needles, as recommended by Messrs. Burroughs Wellcome and Co., were used in carrying out the test.

Immediately before use the contents of the capillary tube were expelled, by means of a small rubber teat, into the bottle of diluting fluid and gently mixed, the resulting mixture giving a toxin strength of one-fiftieth of M.L.D. in 0·2 cubic centimetre.

After cleaning the skin of both forearms with surgical spirit, 0·2 cubic centimetre of the unheated diluted toxin was injected into the skin of the flexor aspect of the left arm and an equal amount of the heated diluted toxin into the skin of the flexor aspect of the right forearm.

It is essential that the injections be made between the layers of the skin, and the best method of ensuring this is to support the arm either on the thigh of the operator, who stands facing the patient with one foot resting on a chair or with the arm extended on a table.

The syringe is held almost parallel to the skin and the needle inserted with the aperture upwards. When the needle has penetrated between the layers of the skin, it is visible as a dark blue line, and if properly inserted, considerable resistance will be felt when the contents of the syringe are being injected. As the toxin is being injected a white, almost circular, area about the size of a threepenny-bit is seen spreading out between the layers of the skin.

If the needle is found to have penetrated below the skin it is best to raise the point of the needle and enter between the layers of the skin from below, instead of withdrawing and re-inserting the needle.

The needles were placed in absolute alcohol between injections and the alcohol allowed to dry off before use.

The tests were performed by two operators, one injecting the unheated, and one the heated toxin. Separate syringes and needles were used by each operator.

The results were read and recorded on the third and fourth day after injection.

Positive results consisted of a very definite area of redness surrounding the site of injection of the unheated toxin, the area varying in size between a shilling and a half crown.

This area remained quite distinct for at least fourteen days, becoming gradually of a dusky brown tint with scaling. The control arm showed no reaction.

Negative results showed either no reaction, or at most a very slight

redness at the site of injection, the redness having completely disappeared by the third day.

Pseudo reactions were classified as positive pseudo (susceptible) and negative pseudo (immune), the former showing a persistent red flush with the heated toxin, and a larger persistent red flush with the unheated toxin, while the latter showed a fainter non-persistent flush which was equal in both arms.

Of the eighty-five boys whose ages varied between 9 and 12 years, thirty-eight showed a definite positive reaction, four a positive pseudo, two a negative pseudo reaction, and forty-one were definitely negative.

Those showing a positive reaction were immunized by injections of 0·5, 0·75, and 1 cubic centimetre toxin-antitoxin mixture at weekly intervals.

With these doses no local or general reaction was observed.

THE INCUBATION PERIOD IN MALARIA.

By Major R. F. O'T. DICKINSON, O.B.E.
Royal Army Medical Corps.

It is usually stated that about two weeks must elapse before a sufficient number of merozoites are thrown into the circulation to produce enough toxin to constitute an "attack of malaria."

Some authorities state the incubation period varies between seven days and several weeks.

My own experience has been in many cases which have paid only one visit to the coast, that it takes about twelve to fourteen days from the time of the bite of the mosquito till the time that symptoms develop.

There is no malaria at Vacoas Camp, Mauritius, for in every case of malaria during the last two years it has been possible to trace its connexion with Fort George which is on the coast, and where *Anopheles costalis* breed freely.

Qm.-Sjt. X., Royal Engineers, went down to the sea on an afternoon bathing picnic on Thursday, January 28. The party having bathed and enjoyed themselves thoroughly, started back at 6.30 p.m., which was an hour later than they had intended.

Exactly seven days later, February 5, he reported sick with a temperature which ran up to 105° F. at 10 a.m. A blood-smear showed M.T. parasites, fine rings, and marginal forms.

As this N.C.O. could not have contracted the disease locally and had not left the camp for some weeks before the attack, there can be no doubt that the facts are as stated above. He had never had malaria before.

I venture to report the case as the incubation period in my own cases is nearly twice as long, and because as far as I know it is much shorter in this case than usual.

Travel.

A KASHMIR DIARY.

By Major D. T. M. LARGE.
Royal Army Medical Corps.

While we were sitting in our camp one morning, a string of coolies came chattering by, obviously having been paid off, and judging by their faces, paid well by some sahib just returned from a trip up the valleys. I stopped them, hoping to find out the state of the path leading from Pahlgam, our camping place in the Lidar Valley, over the mountains to the Sind Valley. We have been thinking for some time of trekking up the Lidar Valley, then across the mountains to the Sind, and from there to wander wherever inclination led us.

We knew that the passes leading over to the Sind Valley would be snow-covered, but we did not know whether the ravines on the other side of the range would be passable or not, as once the snow has begun to melt many of the streams become unfordable.

One of the coolies, whose name I found out afterwards was Aziza, told us that he knew of a path leading over the mountains to Baltal in the Sind Valley, and so we made arrangements with him to come as our guide and head coolie.

Baltal is at the head of the Sind Valley, just under the Zogi La Pass into Ladahk, and from there a tour into the Sind could be made as far as a village called Koolan. From Koolan we could make our way back to Pahlgam and the Lidar Valley by crossing the mountains again by the Yamheur Pass.

And so Aziza described his path, and certainly on the map a footpath led the way he described, over mountain passes and down narrow ravines to Baltal, an easy enough looking path on the map, but one which the guide book described as being used only by shepherds, and then only as long as snow bridges remained. Aziza, however, said he knew the path well, and had been over it just a fortnight before and that the snow bridges were still there.

Pahlgam, our starting place, is a beautiful spot in the Lidar Valley, just where the East and West Lidar streams join. It is a village of tents and there were perhaps forty or fifty separate camps scattered amongst the woods round about. People come up from the heat of Srinagar in June, and spend several months there, fishing or painting or trekking.

The open valley, with the Lidar rushing down through grassy meadows, the pine-clad slopes, at first gentle and suitable for camping, and then

rising steeply into the rocky crags which tower over the valley, make Pahlgam a most ideal camp for those fortunate enough to be able to spend their leave in Kashmir. There is fishing, excellent fishing if you choose to walk a few miles up the east or the west Lidar Valley, while, if you are lazy, it is possible to sit on a rock in the stream as it flows past the camp and catch in an hour half a dozen snow trout, and they are very good eating.

The flowers in Pahlgam attracted us always. When we arrived in June, the wild roses were at their best, and great masses of them made every path pink with colour. English flowers of all kinds grew on the lower slopes of the valley, and climbing up the hillsides, as one neared the snow line, there appeared the delicate flora of alpine levels, the dainty blue or pink primulas, the deep blue gentian and the little pink saxifrage that one associates with wild and rocky places. On the higher margs above Pahlgam, the blue of borage covered the ground, producing a tint so vivid that one was at once reminded of the picture, "June in the Tyrol." The artist indeed, might have painted any of these higher margs, so great is the resemblance. Anemones in great profusion, white and blue, and the white-flowered marsh marigold added to the beauty of these upland meadows.

Pahlgam is the centre of one of the prettiest parts of Kashmir, and the valleys round are delightful. Many of these we walked through day after day, charmed always with the most beautiful views of river, wood and hill, but the walk to Baltal was of a more adventurous nature, as it left the peaceful, almost pastoral scenery of Pahlgam and its neighbourhood behind, and climbed into the grim mountainous region lying around some of the great snowy peaks of Kashmir.

July 12.

From Pahlgam to Astanmarg.

Early this morning Aziza, the tiffin coolie, appeared at the head of a crowd of baggage coolies and by 1 a.m. we were off on the first day's march, a distance of fourteen miles, to Astanmarg. One is always late in starting on the first day of a trek, as all non-essentials have to be weeded out from the belongings one accumulates in a permanent camp, and it is necessary to watch the bearer very carefully to see that he does not overload the coolies with articles which one can do without.

The path to Astanmarg goes up the valley of the East Lidar, past the little Kashmiri village of Pahlgam, merely a dozen or so wooden huts, and after a mile or so enters one of the prettiest parts of the Lidar Valley. Here the river rushes down through pine forest, tumbling over rocks and foaming round boulders. Now and then there is a more sudden drop, over which the water thunders and falls into some deep pool, seething and boiling. Sometimes a huge rock stems the flow, and on the leeward side of that is where the largest fish lie in hiding.

Nine miles along such a path takes one to Tanin, where the valley

opens out, forming a grassy meadow, on which are usually one or two encampments of those Punjabi shepherds or Gujars who bring their flocks up every year from the Punjab to escape the heat, and of course to obtain grazing. One of their women brought me a child with some inflammation of its arm, and asked for medicine for it. What is there that one can do in such a case without medicines or appliances? I told the mother to apply hot wet chuppaties to it, hoping that the heat and the moisture and the clinging nature of the chuppatti would have the effect of a fomentation.

These Punjabi shepherds leave India some time in May, and spend a month on the road to their grazing grounds in Kashmir. They come to the same place year after year, and one old man told me he had come to the same place for twenty years, driving his sixty odd sheep and goats up before the onset of the hot weather, and returning after the rains. They

FIG. 1.—Gujan Hut in Lidar Valley.

live in small tents, several families together, or in little huts built of stones and logs and anything that comes handy (fig. 1). The huts are often roofed with turf, and it is a common sight to see sheep or calves grazing on the roof.

Our path to Astanmarg took us straight up the hill side, past Tanin and above it, mounting up by steep zig-zags for over a thousand feet, over a ridge and into another valley, from which the stream poured down in a series of waterfalls into the valley we had just left. One or two Kashmiris we met told us that Astanmarg was only a few miles off, and that the road was good, with no snow on it.

The Kashmiris one meets on the road invariably greet one with "Sahib, salaam!" and do not as a rule salaam with their hands, as the Indians do. Their respectful, and at the same time self-respecting greeting, reminded us of the "Grüsse" or "Grussg'tt" of the Swiss or Austrian hill folk one meets in the mountains.

It is a beautiful walk to Astaumarg from the hill above Tanin, and especially beautiful are the views looking backwards down the valley, for snowy peaks rise above wooded hills, and the river runs in a deep ravine, high above which is the path. Above the path is a grassy marg, with flocks of sheep and goats grazing over it, attended usually by small Punjabi boys.

Soon the valley becomes narrower and the path comes down beside

FIG. 2.—Crossing a snow bridge.

the river, crossing and recrossing it, sometimes by a snow bridge and sometimes by a tree trunk or two thrown across where the banks are close enough together. These snow bridges are peculiar to narrow valleys, and without them many of these valleys would be impenetrable. During the winter the snow drifts to a tremendous depth at the bottom of the valley, and on the top of the frozen or perhaps empty river bed. In the spring, the melting of the snow exposed to the sun forces a passage along the bed of the river, and soon quite a large river is flowing under perhaps twenty or more feet of snow, which fills up the bottom of the valley. This may

25

last until July or August, forming bridges which are constantly relied on by travellers in Kashmir (fig. 2).

We finished the last half mile or so into Astanmarg by ascending the valley on one of these snow bridges, and then the valley opened out into the flat meadow of Astanmarg, our camping ground for the night.

July 13, 1925.

Astanmarg to Hiurbhagwan.

There are three passes through the hills at Astanmarg, for Astanmarg is simply a meadow right at the head of a valley, which is here enclosed

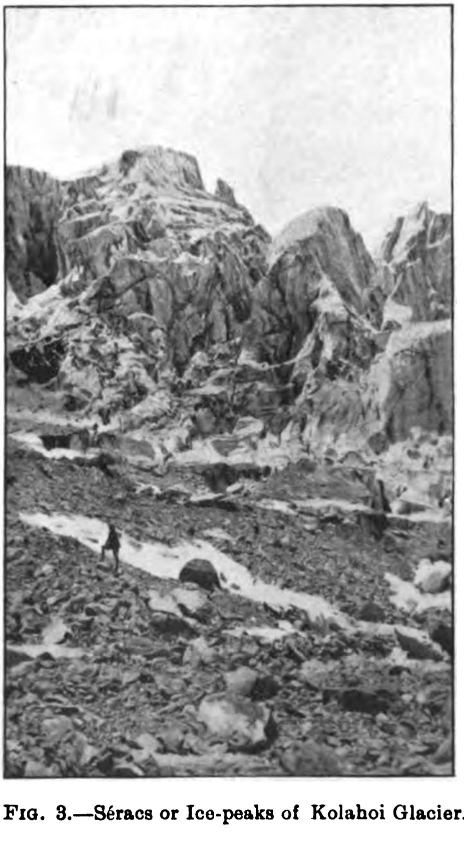


Fig. 3.—Séracs or Ice-peaks of Kolahoi Glacier.

on three sides by high and precipitous mountains. Two of these passes lead to Amarnath Cave, a Hindu place of pilgrimage, and they look particularly desperate places for weary pilgrims to have to cross. The third leads to Baltal, our pass.

The whole region is wild and desolate and almost treeless. There are a few sad-looking birch trees, and even these have mostly been blasted by lightning. But the flowers, although they do not take away from the desolate appearance of the place, are very beautiful. I have never seen

such beautiful columbines, with blue and white petals. There are orange poppies, and blue and pink primulas, and higher up gentians and alpine asters.

The climb up to the pass is about the stiffest we have yet done. The path rises three thousand feet sheer, over grass and rocks, and in parts losing itself altogether. I did not think for a moment that our coolies, nine of them, would ever get up carrying tents, beds and bedding; but they are extraordinary men, very sturdy and used to hill climbing, and we found they kept close behind us all the way.

After many rests, and two hours' very hard work, we got to the highest point of the pass, and immediately came on to snow. The height here is over 13,000 feet, and the pass is level for over a mile, with hills on the right rising another 2,000 feet, and on the left a most extraordinary-looking peak, Razdam by name, completely snow-covered. In shape it is like the lion of Arthur's Seat in Edinburgh, only instead of the head of the lion there is a high peak ending in a sheer precipice which drops 2,000 feet straight down into a little frozen lake on the pass.

We had tiffin just over the top of the pass, in a biting wind and slight rain, and while we were finishing, up came our nine coolies, perfectly cheery, the one carrying the heaviest load, our tent, leading the way. I gave them three cigarettes amongst the crowd of them, and they were delighted even at that. My stock of cigarettes is very low, and as we cannot get any more for about a week at least, if then, it does not do to be too lavish with them.

The way led down a nullah filled with snow, much nicer and easier to walk on than rough rocks, and gradually after an hour or so grass and flowers began to appear.

Soon we saw a valley coming in from the left to join ours, and at the head of this we had a magnificent and quite unexpected view of Kolahoi, the Matterhorn of Kashmir, with a sweep of snowy glacier falling steeply into a green valley below (fig. 3). Very few but shepherds ever go this way, and so this fine view of Kolahoi is not well known. Far below us in this valley we could see an inviting meadow, which we hailed with delight as an ideal spot in which to camp for the night, but when we hurried down to it found to our disappointment that there was no fuel. So there was nothing for it but to push on further. As we went on we found that the valley suddenly fell away with a sheer drop of over a thousand feet. Down this cliff the stream cascaded into a narrow rocky gorge, and down this cliff we too had to make our way, not an encouraging journey as we could see nothing at the bottom but a snow bed; so it was a pleasant surprise when we came on a few Gujar huts and a tiny green patch, where we pitched our camp for the night. Here the Gujars were only too glad to provide us with fuel and goat's milk. They informed us the place is called Hiurbhagwan.

(*To be continued.*)

Current Literature.—Abstracts.

ESTY, J. R. and STEVENSON, A. E. **The Examination of Spoiled Canned Foods.** *Journ. Infect. Dis.*, 1925, v. 36, 486-500, 2 figs. [9 refs.]

This paper emanates from the Research Laboratory of the National Canners' Association, indicates the methods employed by this laboratory in the examination of spoiled canned foods, and is an endeavour to utilize these methods as a means of diagnosing the kind of spoilage and the fault or faults in manufacture which are to blame. It is based upon an examination of over 600 samples during six years. Spoilage is traced either to leaky tins or to under-processing. [Processing is the trade name given to the treating of the tins after closure, often inaccurately called sterilization.] The paper includes a description of the different types of cans which differ from the normal ("Flippers," "Springers," "Swells") and also of the methods used for the physical examination of the cans and of the seams, particularly of the double seams, i.e., the joint made where the lid is crimped on to the body of the ordinary sanitary can.

The bacteriological examination is described in detail and includes incubation of the unopened tin for ten days at 37° C. and 4-7 days at 55° C. Foods with acid and non-acid contents are treated differently. For non-acid contents standard plain and glucose nutrient broths, of pH 7 with brom-cresol purple indicator, are used, while direct plating is not employed. Tubes are incubated at both 37° and 55° C. for at least one week. For tomatoes and fruits (acid contents) special media having tomato juice as a base have been found of value. A mixture of tomato juice and nutrient broth in equal parts with 1 per cent glucose is used. A tomato juice glucose broth agar is also used for isolation of the organisms after growth in the liquid medium. A routine examination for *B. botulinus* is not considered necessary. Direct microscopic examination of smears from the contents is advocated, while the physical examination of the contents should be noted.

The authors consider that it is possible from their laboratory findings to indicate whether the unsound conditions found are due to under-sterilization or to the leakage of bacteria through seam defects. The essential object of the investigation is to be able to advise the canner as to the nature and source of the defect and enable him to take steps to obviate this cause of commercial loss. The authors set out in tabular form their views as to this relationship. W. G. SAVAGE.

Reprinted from "Bulletin of Hygiene," Vol. 1, No. 3.

LOMHOLT, S. **Notes on the Pharmacology of Bismuth, with Reference to its Employment in the Therapy of Syphilis.** *Brit. J. Ven. Dis.*, 1925, v. 1, 50-7. [4 refs.]

The chief interest in this paper is in the facts disclosed as to the absorption and elimination of some compounds of bismuth and in a simple, inexpensive method of preparing bismuth hydroxide. As to absorption, this can be studied for purposes of comparison by testing the rate of elimination. One-third of the injected bismuth leaves by the bowels and two-thirds by the kidneys. Estimating the amount of bismuth in the urine by HEVESEY's new method, the author compared the elimination of three compounds—(1) bismuth hydroxide; (2) vijochin, or iodobismuthate of quinine; and (3) tartro-bismuthate of potassium and sodium, all in oily suspension, and found that (3) was eliminated three times, and (2) twice as rapidly as (1).

When the vehicle of suspension, or solution, was changed to water the rate was increased very considerably. Thus, in fourteen days the percentage of the injected doses which had been excreted was:—

	Oily suspension.	Watery suspension or solution.
Bismuth hydroxide	7·58	47·46
Idiobismuthate of quin.	15·57	44·00
Tartro-bismuthate of potass. and sodium.. ..	22.20	50·26

For this reason the watery suspensions, or solutions, are to be preferred. Of the three compounds tested, bismuth hydroxide is considered to be the most desirable as the tartro-bismuthate is absorbed too quickly and vijochin is too bulky. The author's method of preparing bismuth hydroxide in a form suitable for injection is as follows:—

"Twelve grammes of basic nitrate of bismuth are dissolved in dilute nitric acid. An excess of ammonia is added to the solution, throwing out a precipitate of bismuth hydroxide. This precipitate is carefully washed out, preferably under aspiration. Then 10 c.c. glycerine and 40 c.c. sterile water are added, resulting in a 2 per cent suspension of bismuth hydroxide, which has cost less than one halfpenny per dose of 0·2 gramme."

L. W. HARRISON.

Reprinted from "Bulletin of Hygiene," Vol. 1, *No.* 3.

BUCHAN, G. F. **Methods of Prevention in Diphtheria and Scarlet Fever.** *Public Health*, 1925, v. 39, 33-9.

The author in his Presidential address to the Society of Medical Officers of Health, first sets out the methods generally employed for the prevention of these diseases, viz.: (1) hospital isolation; (2) disinfection; (3) quarantine of contacts; (4) general improvement in sanitation.

(1) Hospital isolation is not effective as a means of prevention of

diphtheria and scarlet fever, but has been associated with a reduction of case mortality.

(2) In regard to disinfection the author concludes that the methods in general use are without influence in prevention of the spread of these diseases. He gives the results of an experiment carried out in Willesden for five years, 1917-1921.

"Willesden was divided into areas for disinfection and in the houses in which diphtheria or scarlet fever occurred disinfection was carried out according to the area by (*a*) formalin spraying of rooms with bedding and clothing therein, or (*b*) removal and steam disinfection of bedding and clothing, or (*a*) and (*b*) formalin spraying of rooms with removal and steam disinfection of bedding and clothing."

Judged by the percentage of "secondary cases" recorded, it would appear that method (*b*) is less effective than method (*a*) and that method (*a*) alone, in the case of scarlet fever notably, is more effective than the combination of (*a*) and (*b*). The author's opinion in regard to the utility of these methods of disinfection agrees with that expressed by Chapin, of Providence (1905) and by Forbes, of Brighton (1910). The percentage of "return cases" recorded during the five years' experiment is given as follows :—

	Home treated.	Hospital treated.
Diphtheria	None	3·1 per cent.
Scarlet Fever	3·7 per cent.	14·1 per cent.

"Isolation hospitals, by increasing the length of infectiousness of cases, defeat to some extent the object of prevention for which they have been established." [Before this conclusion can be accepted at its face value, it will be necessary to have more detailed information of the home conditions of the two classes of cases. It may be safely assumed that the conditions in the home treated cases were sufficiently good to permit of the patient being effectively isolated and that the social grade of these patients was at least on the average higher than that of the hospital treated cases.]

(3) "Quarantine of well contacts, especially if they are children, cannot be effective practically as a means of prevention of diphtheria and scarlet fever."

The author then discusses the reasons commonly given for the failure of present methods of precaution and expresses the opinion that "missed" cases no doubt to a small extent are accountable and that "carrier" cases increase "the difficulties of control and may indeed be the source of regeneration and continued prevalence of these diseases." He then deals with the question of the application of more recent findings of research to the problem, viz., the Schick test for susceptibility and toxin-antitoxin immunization in diphtheria and the corresponding work of the Dicks in relation to scarlet fever, and goes on to advocate that Local Authorities should assume the responsibility of making these modern methods of protection and prevention available in their areas. If the suggestion were

adopted, he is of opinion that an enormous reduction in expenditure on isolation hospitals would follow as well as great benefit to the community by the "reduction of suffering, damage and death from diphtheria and scarlet fever." A. F. CAMERON.

Reprinted from "Bulletin of Hygiene," Vol. 1, No. 3.

HARRIES, E. H. R. **Serum Treatment of Scarlet Fever.** *Public Health.* 1926, v. 39, 104-10. [20 refs.]

It is difficult to compare the results of different forms of treatment of scarlet fever because we are dealing with a disease which varies greatly in severity and in type in different countries, and even in different parts of the same country at the same period and also in the same country at different periods. [It is to be noted that the difficulty of comparing results of different methods of treatment of scarlet fever is specially great in England at present on account of the mildness of the type of the disease now prevalent.] In analysing the results of treatment by a therapeutic serum, it is necessarv to consider to what extent the results are due to: (1) a non-specific protein therapy; (2) specific antibacterial properties; and (3) specific antitoxic properties possessed by the serum.

(1) *Non-specific protein therapy.*—Observers have stated that the therapeutic effects of serum from any source are to be ascribed to a protein therapy and are non-specific. It has even been maintained that normal horse serum has a better curative power in diphtheria than the specific antitoxic serum. The author considers this an extreme view, but states that he has found that the administration of normal horse serum in doses of 50 c.c. intramuscularly in cases of scarlet fever of definitely septic type produced a definite improvement, shown by cessation of rhinorrhœa, diminution of adenitis and progressive fall of temperature. He used the diphtheria antitoxic serum in order to obtain fresh horse serum, but the cases to which he refers were not suffering from superadded infection of diphtheria. In considering this result it is necessary to remember that many cases of this definitely severe septic type apparently improve quite as satisfactorily under purely symptomatic treatment.

(2) *Specific antibacterial serum therapy.*—Many antibacterial sera have been employed in the treatment of the disease and have been abandoned in turn. Of late years polyvalent antistreptococcal sera have been used "with a measure of success when definitely directed against the septic manifestations." The results obtained by these sera are irregular and uncertain, but such sera have their value when given early and in sufficient dosage (when septic conditions are just beginning to show themselves). In the author's opinion they are of no value when the septic conditions are well established or in doses of less than 50 c.c. to 100 c.c. Upon the primary manifestations of toxæmia they have no appreciable effect.

(3) *Specific antitoxic serum therapy.*—The use of human convalescent serum is limited by the impossibility of obtaining adequate supplies and the necessity of making at least a preliminary Wassermann test. Cases have been reported in which definite improvement followed the use of this serum or of whole blood citrated. One of the earliest sera produced by the immunization of horses by means of the hæmolytic streptococci was MOSER'S (1902), which had definite antitoxic value but produced very severe serum sickness, and for this reason was abandoned. The recent DOCHEZ serum is obtained by immunizing horses with the hæmolytic streptococci of the DICKS, and sera have been produced by the use of the specific toxin derived from the hæmolytic streptococcus. The author's experience of the use of the latter type of antitoxic serum has convinced him of its value in the toxæmia of scarlet fever. It is probable that the minimum therapeutic dose of the serum as it is at present obtainable is not less than 40 c.c. and that larger doses up to 80 c.c. and 100 c.c. are necessary.

The author is careful to characterize his results as tentative only, on account of the small number of his cases. He gives a summary of these results:—

(1) On the whole, pyrexia and tachycardia are reduced more rapidly by serum.

(2) Blanching of the rash occurs only in early cases, i.e., in rashes less than 24 hours old. It is pointed out that the intensity of the rash is not a very reliable guide to the degree of toxæmia and that the effect on the rash has not so high a value as an indication of improvement as the effect on the enanthem and the constitutional condition of the patient. It has been noted that nervous manifestations of toxæmia have been brought quickly under control. Delirium has rapidly passed off.

(3) Septic complications in their early stage are lessened. A decrease is noted in rhinitis and in early adenitis, which may be due to the decrease in the congestion of mucous membranes. In regard to septic conditions, the author agrees with the opinion of the DICKS that by removing toxæmia not only is the true extent of septic involvement made evident but that the patient is better enabled to tackle it. Established septic conditions are not affected by the serum.

(4) No case of nephritis or of carditis occurred in the series of cases, but the author states that the number is too small to make the observation of value.

(5) Serum sickness occurred in practically every case. Concentration of the serum would remove this undesirable feature, but before concentration can be carried out it is necessary to have some idea of the antitoxic value of the serum. Standardization in the laboratory is at present impossible.

A. F. CAMERON.

Reprinted from "Bulletin of Hygiene," Vol. 1, No. 3.

Reviews.

PROTOZOOLOGY: A MANUAL FOR MEDICAL MEN, VETERINARIANS AND ZOOLOGISTS. By C. M. Wenyon, C.M.G., C.B.E., M.B., B.S., B.Sc. In two volumes. Pp. x + 1563. London: Baillière, Tindall and Cox. Price £4 4s.

For many months the appearance of Dr. Wenyon's manual has been expectantly awaited, not only by protozoologists but also by that larger number whose interests encroach in some degree on the protozoological domain. Those privileged to see the work in the course of preparation had formed some conception of the immensity of the project, and of the enormous labour involved in its completion. But the actuality far outstrips expectation, and the reader stands amazed at the learning, the painstaking industry and sedulous care which have gone to the making of this monumental work. The author devotes his first 150 pages to a general description of the protozoa, their organization, morphology, modes of reproduction, and so forth. Here the reader will note the acceptance of the orthodox conception of the essential distinction between these lower forms and the multicellular animals, in opposition to Dobell's contention of the non-cellular nature of protozoa. After the prefatory introduction there follow detailed and systematic accounts of the various groups of protozoa, not only those of a parasitic habit, but also the free-living forms of which a working knowledge is so essential to the student of the pathogenic protozoa. The various specific descriptions are written in a pleasantly discoursive manner, and include a complete survey of the literature of the subject together with a critical analysis of any divergent views that may obtain. A very striking feature is the large number of instances where the author can produce first-hand experimental evidence regarding points in dispute. Amongst matters of more than specialist concern it is interesting to find Stimson recognized as the discoverer of the causative organism of yellow fever. This worker described and figured spirochætal bodies which he observed in the kidney of a case of yellow fever after staining by Levaditi's method; these are identical with the organisms isolated by Noguchi twelve years later, and so by the law of priority Noguchi's specific name *icteroides* lapses and the name of the yellow fever spirochæte becomes accordingly *Leptospira interrogans* (Stimson, 1907). Another change in nomenclature is the revival of *Treponema* for the generic conception which includes the organism of syphilis. Independent status is accorded to *Leishmania* on the grounds of their development in vertebrates, though it still remains to be shown that this is a necessary stage in the life history of these parasites. An anxiety to separate rather than to unite is a distressing character of the zoological tribe, so it is the more pleasing to find the generic validity of the subdivisions of *Babesia* controverted, and in like manner all the hominid *Trichomonas* are held to be only *Trichomonas vaginalis* writ large.

To the treatise is appended a list of vertebrate and invertebrate hosts of parasites amounting to some sixty pages, and 100 closely-printed pages of references to the literature of protozoa and spirochætes, compilations which represent an enormous aggregate of pertinacious toil.

Here or there in the volumes the close reader may detect a slip of the pen, or some minor omission, but these in a work covering such an enormous range are inevitable. Indeed, humble folk who have not escaped whipping for their own shortcomings in printed papers may derive some degree of consolation from those slight evidences of humanity, and find comfort in the Chaucerian reflection:—

"And if gold ruste what shall iren doo?"

The numerous illustrations are excellently done, and some of the coloured plates, apart from their primary instructional aim, have much artistic merit. Finally it is no exaggeration to say that the publication of this complete manual sets the study of protozoology in Britain on a new plane. W. P. MacA.

DISEASES OF THE NOSE AND THROAT. By Sir StClair Thomson. London: Cassell and Co., Ltd. 1926. Pp. xvi + 943. Price 45s.

The foundation of Sir StClair Thomson's "Magnum Opus," well described as the "The Laryngologist's Bible," was so well and truly laid down in 1911 that there has been little need for radical alteration fifteen years later. It will be found, however, that nearly every section has undergone some alteration, always with advantage.

Some noteworthy revisions have been made in the sections relating to malignant disease of the larynx, dilatation and stenosis of the œsophagus, cocaine substitutes and certain diseases of the nose. Tonsillotomy has at last and rightly been omitted from the list of operations to be recommended. A number of new operative procedures have been added and it is particularly gratifying to note the inclusion in this edition of Mr. Howarth's external frontal sinus operation, which is gradually and deservedly taking the place of all other external frontal sinus operations.

Throughout the book Sir StClair Thomson has been particularly generous in acknowledging the efforts of his younger colleagues. All the author's communications are so valuable that it is considered unnecessary to waste space in enumerating obsolete theories of mere historical interest as instanced in the chapter on congenital larnygeal stridor.

The section dealing with the larynx is, as was to be expected from such an eminent authority, of surpassing excellence. The importance of early diagnosis in all laryngeal conditions, particularly in carcinoma and tuberculosis, is again emphasized. The author's operative results in early intrinsic carcinoma of the larynx are so generally well known that comment is superfluous. Occupying the position of pioneer and teacher as he does, Sir StClair Thomson correctly confined his operative procedures almost entirely to early intrinsic carcinoma and by doing so he has proved to the profession the importance of early diagnosis—and his splendid operative

results indicate that early carcinoma offers more hope of permanent cure in such a situation than in any other.

As one who has been privileged to watch the author performing a laryngo-fissure for an early growth of the vocal cord, it is rather surprising to note that, in his description of the operation, the author omits a part of his technique which is of great assistance in demonstrating the growth—namely, a manœuvre by which the ala of the thyroid on the side of the growth is partly subluxated, thus bringing the affected cord well into view.

The chapter on operations has been fully revised, while radium, X-ray treatment and diathermy have naturally received more attention. The illustrations have been increased in number and some, particularly the radiograms, have been improved in quality.

The work as a whole reflects the greatest credit on British laryngology and on its very eminent author.

It is undoubtedly the best book of its kind in the English language. J. H.

Handbook of Diseases of the Rectum. By Louis J. Hirschman, M.D., F.C.A.S. Detroit, U.S.A. Fourth edition. 1926. Published by Henry Kimpton, 263, High Holborn, W.C. Pp. 403. Price 30s. net.

A handy volume of nearly 400 pages, and containing over 250 well reproduced illustrations and five coloured plates. The book is well indexed and printed on good paper.

In his preface to this edition the author states that "there has been no attempt to in any way include major surgery, but to keep it within the scope originally intended. With the perfection of the technique of sacral anæsthesia, in addition to local and regional anæsthesia, *practically every operation on the anus and rectum can be performed by a qualified surgeon without general anæsthesia.*"

In the reviewer's opinion, Chapters 4 and 5 alone, which deal with the author's methods in employing infiltration anæsthetics in this class of surgery, contain enough interesting points to make the book well worth study.

It is refreshing to pick up a medical book and become so absorbed in it that one has almost completed it before the fact is realized. The subject matter is dealt with systematically, beginning with anatomy, the symptoms that should direct attention to the rectum, examination of the patient and then going on to discourse on the ailments common to the region. Presumably because it belongs to the realm of major surgery, carcinoma is not included in a special chapter. Dr. John L. Jelks is responsible for the chapter on the dysenteries. It contains a rather rambling lot of statements on the subject and its causes, somewhat out of place in such a handbook, and yet too incomplete for a work on tropical diseases. The fact that the writer holds views that are not in accord with those in other countries, is by no means one that should induce adverse criticism, but the chapter is very sketchy and seems to lack conviction.

The rectum is not supplied with sensory nerves, particularly in its upper half. This accounts for the comparative absence of pain when the rectum proper is diseased, and the author states that the ample nerve-supply of the lower part of the bowel accounts for the intense suffering caused by lesions in the anal canal.

Rectal hæmorrhage, no matter how slight, should never be taken as diagnostic of hæmorrhoids or any other disease, but should call for complete examination. Frequent and painful urination, pressure symptoms in the bladder, pain and burning at the vesical neck, enuresis: all may be due to a number of anal or rectal disease conditions. Fissure and ulcer are the most frequent causes of bladder irritability.

The author considers that the old method of having the patient simply bend or lean over a chair or table, then inserting the index finger, is absolutely to be condemned! It is not nearly so satisfactory or comfortable for either examiner or patient as the lateral Sims's position.

He states that the extent of anæsthesia produced depends, not so much on the strength of the solution, as upon the pressure produced on the nerve endings by the *amount* of the solution injected, rather than its strength.

Better or more complete anæsthesia cannot be produced from stronger solutions than ½ per cent of novocain, apothesin or quinine-urea.

Hirschman then explains why he prefers the hydrochloride of quinine and urea as a regional anæsthetic.

(1) It is non-toxic and can be given in unlimited dosage. Brewster has used 100 grains intravenously within six hours in a patient suffering from pernicious malaria.

(2) The prolonged anæsthetic effect. In many cases post-operative anæsthesia lasted from four to five hours to as many days and longer.

(3) Where the solution containing one per cent or over is used the hæmostatic effect produced by the deposition of fibrinous exudate is of extreme value in preventing post-operative oozing.

He never uses soap-suds for injection into the rectum, for it has been found just as irritating to the mucous membrane of the rectum as to that of the eye or nose. He almost invariably employs two drachms of sod. bicarb. to a quart of lukewarm water for enemata. He never uses a hard rubber or glass enema tube, except as a connector over which a large-sized soft rubber urinary catheter is fastened.

The author considers divulsion or dilatation of the sphincter muscles is never necessary in any ano-rectal operation. The brutal tearing apart of sphincter fibres while the helpless patient is under a general anæsthetic is an unjustifiable and unnecessary indignity. These muscles will relax to complete flaccidity under sacral anæsthesia and be put more completely at rest than by forcible bimanual assault.

Causes of hæmorrhoids. The usual textbook theories on the causation are enumerated; then the author goes on to say, "a more common cause, however, other than constipation, is the effort to relieve constipation by means of purgatives, the unnatural straining and irritating liquid stools

being responsible for more cases of hæmorrhoids than the constipation itself."

The author characterizes the "injection or palliative method of treatment as an unsafe method." This is on account of the risk of sloughing with sepsis, and the detachment of thrombi. In any case it is applicable to only suitable cases. He recommends five to ten per cent. sol. of quinine urea hydrochloride as the best and safest.

It seems to the author much more rational to remove the hæmorrhoid by a clean-cut surgical incision, under local anæsthesia, and have the patient up and about on the second day, and the wound healed in from a week to ten days—than to use the uncertain, unscientific injection method.

The author thinks the clamp and cautery operation is not applicable under local anæsthesia. He believes that the use of a red-hot iron in a cavity lined with mucous membrane is not rational, and has seen strictures following its use which were caused by the over-growth of scar-tissue—which is more prone to follow a burn than any other form of wound.

The symptoms of multiple polyposis are those of chronic diarrhœa, colitis and dysentery.

Amœbæ have been found free in the peritoneal cavity, and in other parts of the body, especially the liver. In cases of amœbic dysentery, when unassociated with collateral organisms, the parasites are non-pyogenic.

The author condemns treatment by ipecac. It has been known to produce death and does not cure the disease. Its alkaloid, emetin, has been given by the author in half to one grain doses in perhaps 200 cases, with very certain and uniformly good results, in so far as concerns the relief of symptoms and healing of ulcers, yet he has never cured a case of amœbic infection by this treatment. They will, and do have relapses, and recurrence of symptoms, therefore the author concludes the remedy is deceptive, and the cases are carriers of the infection.

For colon lavage: formaldehyde solutions in the strength of 1-500 or 1000 with boric acid semi-saturated or in weaker solutions, have afforded the best results. The author concludes that this chemical (formaldehyde), judiciously used, is really the most effective in the destruction of the amœbæ and associated organisms, and most valuable in the treatment of dysentery D. C. M.

VITAL CAPACITY OF THE LUNGS. By J. A. Myers, M.S., Ph.D., M.D. With Introduction by S. Marx White, B.S., M.D., F.A.C.P. Baltimore: Williams and Co. 1925. London Agents: Baillière, Tindall and Cox. Pp. 140. Price 14s. 6d. net.

This book is divided into six chapters, which deal with the subject of Vital Capacity of the Lungs, as follows: (1) Historical. (2) Factors influencing vital capacity. (3) Influence of disease. (4) Limitation of its use. (5) Measurements and instruments used. (6) Normal standards.

A knowledge of the value of vital capacity estimations has become more

important during the last decade on account of the position which this measurement has assumed as an aid in assessment of efficiency in aviators, etc.

We think its value greater in controlling training rather than in the selection of recruits.

This small book deals with the whole subject in an attractive manner, and a large number of tables are given showing the correlation of vital capacity with chest circumference, height, weight, age, and sex.

As regards the chapters on Vital Capacity as an aid to diagnosis in disease, we are of the opinion that while the test has a distinct place in assessment of physical efficiency, there is a danger of over enthusiasm in its application in disease.

This is a book for the hygienist and the physiologist, especially those working in recruiting and training problems, rather than for the clinician.

A. G. C.

WHAT'S BEST TO EAT? By S. Hemming Belfrage, M.D.Lond., M.R.C.S., L.R.C.P. With a PRACTICAL SUPPLEMENT by Lucy H. Yates, M.C.A. London: Heinemann (Medical Works), Ltd. Pp. xi + 199. Price 7s. 6d. net.

The answer to the title of this book is told in two parts—Part I by Dr. Belfrage and Part II by his collaborators—with a single page foreword by the Professor of Biochemistry, E. V. McCollum, of Johns Hopkins University, another single page preface by the author and a more lengthy introduction. There is a scientific and popular side to Part I, the former represented by an exposition of the new theories of the bio-chemistry and vital energy of foodstuffs, and the latter by somewhat exaggerated and not altogether accurate statements of the dire results of neglecting even in the smallest degree the teachings of science in the food we eat, and the enormous benefits to the physical and mental well-being of the community and the individual in a diet containing all the essentials for supplying the body with vital energy. Vitamins naturally take a prominent place, but there are also chapters on proteins, the mineral salts, the fuel foods, the passage of food through the body, intestinal stasis, food and disease. The author's methods of deduction and reasoning are open to criticism. For example, he regards it as not unlikely that even criminal tendencies in humanity are to a great extent fostered by faulty habits of feeding through several generations, because, in experiments in feeding animals, it has been found possible to alter profoundly their behaviour, temper and activity by very slight alterations in their diet over a limited period. Again, it is stated that during the Great War the death-rate in Denmark fell thirty-four per cent, because the shortage of bread stuffs compelled the use of the whole grain of wheat, barley and rye instead of feeding pigs with the offal; a statement we are not prepared to accept without further inquiry. Again, beri-beri is said to have disappeared from the Japanese Navy on active service by adding fish, milk and vegetables to the ration, whereas, if we

remember rightly, it disappeared by the addition of a proportion of whole meal to the rice ration on the advice of the late Baron Takaki. Equally inaccurate appears to be the statement that an outbreak of beri-beri amongst British troops in Mesopotamia was stopped because the supply of white flour gave out and the men had to be supplied with native whole meal. According to the official medical history it was stopped by adding experimentally a proportion of atta to the white flour and including an issue of marmite in the ration.

But apart from these defects, of which other examples might be quoted, and which do not necessarily detract from the popular value of the book, Dr. Belfrage has done well in producing an interesting guide towards the arrangement of our daily food. The practical supplement in Part II provides us with a number of recipes for the preparation of dishes of milk and milk products; wholemeal cereals; vegetables and fruit; meat, fish, poultry and eggs; and sugar, nuts, oils and condiments; together with one or two specimens of simple menus with vitamin contents and other dietetic essentials. But as regards the recipes, we are sure that anyone not a trained cook would make a mess of it, if he or she attempted cooking any of the dishes described, so much seems to depend on the particular ingredients of the sauces and the timing of all kinds of culinary operations.

Correspondence.

COMPARISON OF STOVARSOL AND EMETINE HYDROCHLORIDE IN THE TREATMENT OF AMŒBIC DYSENTERY.

TO THE EDITOR OF "THE JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—I have read with interest the article by Majors Newman and Davies on the treatment of amœbic dysentery in the October number of the Journal.

It is now some years since we at home began to realize the efficacy of stovarsol in the treatment of chronic dysentery, particularly in cases which had relapsed after several courses of emetine.

Our experience warranted the belief that stovarsol would be found as effective in the acute stage, and Majors Newman and Davies, even though their cases are few in number, have justified this belief.

I am glad that they have emphasized the "tonic" effect of stovarsol. which of itself must contribute in no small degree to a satisfactory cure.

I would point out, however, that the results of the stovarsol treatment in preventing relapses might have been still better had the drug been administered for a longer period. The practice at home now is to give four grains twice a day for a month, and in a large number of cases I have heard of only one that showed signs of any intolerance to the drug.

I am, Sir, &c.,

J. C. KENNEDY,

Colonel.

Consulting Physician to the British Army.

Reports and Analyses.

MARTINDALE STERULES.

MARTINDALE'S sterules of peptone have been used in military medical practice for the past two years.

It has been found to be the most convenient form of peptone to use for the desensitization of the body, whether local or general, particularly in cases of local sensitization such as seborrhœic dermatitis that has been scratched and infected with a skin staphylococcus, and of general sensitization such as urticaria.

The peptone is made up in two strengths: five per cent for intravenous and 7½ per cent for intramuscular injections. The doses are graduated, starting at 0·3 cubic centimetre and rising to 1·5 cubic centimetres for the last four doses in the series of ten. For the *follow up course*, six doses, three of 2 cubic centimetres and three of 2·5 cubic centimetres, are recommended. The injections are given twice a week and there is no reaction after them.

The sterules being in graduated doses make the giving of the course "fool proof," and an overdose in a highly sensitive patient is impossible.

Injections of peptone may be given to assist the therapeutic effect of specific vaccines as in the treatment of hay fever, and they have a remarkable effect on most cases of asthma.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels, Clinical and other Notes, and Echoes of the Past.

Any demand for *reprints, additional to the above*, or for excerpts must be forwarded at the time of submission of the article for publication.

Notices of Births, Marriages, and Deaths are inserted in the *Corps News*, free of charge to subscribers. All communications should be written upon one side of the paper only; they should by preference be typewritten; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS." War Office, Whitehall, S.W.1.

The Committee has sanctioned the publication of correspondence on matters of interest to the Corps, and of articles of a non-scientific character under a nom-de-plume. These communications must, however, be approved by the Editor before publication.

Cheques or Postal Orders should be made payable to the "Manager, Journal R.A.M.C." and crossed "Holt & Co."

All communications should be addressed to THE MANAGER, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," A.M.D.2, WAR OFFICE, WHITEHALL, S.W. 1.

Following Severe Disease

during which there has been considerable disturbance of metabolism, recovery frequently "hangs fire".

This is often due to an inadequate supply of the "chemical foods", calcium, sodium, potassium, manganese, phosphorus, and iron. These, together with the "dynamic" effect of small doses of quinine and strychnine, usually overcome such physiological inertia.

Compound Syrup of Hypophosphites

TRADE **"FELLOWS"** MARK

is the ideal form in which to administer the above, being bland, stable, non-irritating and efficient, to which 60 years of increasing use bear witness.

Samples and Literature on request

Fellows Medical Manufacturing Co., Inc.

26 Christopher Street **New York City, U. S. A.**

VALENTINE'S MEAT - JUICE

In cases of **Extreme Exhaustion,** at **Critical Times,** in **Wasting Diseases, Low Forms** of **Fever, Cholera Infantum, Diarrhoea, Dysentery, Influenza, Pneumonia** and **Phthisis,** when other Food fails, **Valentine's Meat-Juice** demonstrates its Power to **Sustain** and **Strengthen.**

For sale by European and American Chemists and Druggists.

VALENTINE'S MEAT-JUICE CO.,

Richmond, Virginia, U. S. A.

CB 93

No. 6. December, 1926. Vol. XLVII.

Journal

OF THE

Royal Army Medical Corps

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

BREVET-COLONEL A. E. HAMERTON, C.M.G., D.S.O., R.A.M.C.

ISSUED MONTHLY

Printed and Published by
JOHN BALE, SONS & DANIELSSON, LTD.
83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

Price Two Shillings net

Vol XLVII. December, 1926. No. 6.

Journal of the Royal Army Medical Corps.

Original Communications.

OLD-TIME PLAGUE IN BRITAIN.[1]

By Lieutenant-Colonel W. P. MAC ARTHUR, D.S.O.
Royal Army Medical Corps.

It has been suggested to me that, before commencing our subject proper this evening, it might be advisable to touch on a few points in the bionomics of fleas which affect their carriage of plague and its transference to man. No doubt these matters are familiar to most of our members, but I hope they may be of interest to some. First of all, I would venture to remind you that of the four stages in the development of fleas, the first three are free and independent, and are passed usually in the nest or other habitation of the host, and only in the adult stage is the flea parasitic, or rather, predatory. Consequently, the animals which tend to harbour fleas are those which provide themselves with some nest or den, to which they return; and as the developing fleas reach maturity here, they, in their turn, attack the host. Whereas animals like monkeys and deer, under natural conditions, have no permanent home, and so are normally free from fleas. It is an interesting point that stray dogs of the real homeless variety do not harbour fleas, though they are usually found to be swarming with lice—a practical illustration of the totally different breeding habits of these two insects.

[1] This account of plague in Britain was an informal address, delivered entirely without notes, even to the quotations cited, and taken down by a reporter in attendance. It was merely intended to interest those who have never had occasion to inquire into these matters for themselves, and makes no pretence to be a serious historical contribution. In consequence, no references are given, nor any acknowledgment made of borrowed material; but, with one exception, all the chronicles named or quoted, as well as most of the other texts mentioned, have been read in the original. Owing to the popular nature of the discourse, the speaker was most unwilling to agree to publication, but it was felt that so striking and informative an address, as vivid to read as to hear, should not be denied to absent Fellows. Colonel Mac Arthur's too modest reluctance has happily been overcome, to the great advantage of the Society's Transactions. [*Reprinted by courtesy of the Royal Society of Tropical Medicine and Hygiene, and by request of our readers.*—Ed.]

Then again, the larvæ of certain fleas, for example, *Ceratophyllus fasciatus*, require for their development blood, and this they obtain from the fæces of the parent flea. In the case of fleas, and many blood-sucking insects, the process of feeding is closely associated with that of evacuation, and finally, the flea voids from the rectum practically pure blood. It may sometimes happen that we have occasion to wonder if a disturbed night's sleep might possibly have been due to the depredations of one of these ectoparasites picked up somewhere or other. And, short of actually seeing the intruder itself, the best evidence of its presence is to see on the bedding or clothing these minute specks of blood. This necessity for providing the larvæ with food modifies the habits of such fleas in a very material respect, and instead of accompanying their host on its expeditions into the outer world, they tend to remain behind in the nest, so as to provide for the wants of their offspring. But in the case of fleas like *Xenopsylla cheopis* the larvæ do not require blood, and so the adult has no object in deserting the host. This renders such fleas much more dangerous. Take the case of rats infested with *X. cheopis* and making an occasional raid into a grain store. The fleas carried by the rats may lay large numbers of eggs, and the resulting larvæ can feed happily on the grain and other débris, and reach maturity there; and so the whole grain store may become a nursery for fleas. This could not happen under similar conditions in the case of fleas where the larvæ are restricted by the necessity for blood. The difference of habit is important in quite another connexion. A flea census carried out on rats infested with *X. cheopis* and *C. fasciatus* would give misleading figures regarding the respective numbers of these species infesting the rats, because a large proportion of the *cheopis* would be found on the trapped rats, whereas most of the *fasciatus* would have remained in the nest.

Another important characteristic of fleas is that they are not absolutely restricted in their choice of a host. In this respect they differ entirely from lice, and if plague were carried by lice the disease would never spread to man at all. Although a flea usually prefers its own particular host, yet, in the absence of this, it may live happily on animals of quite another kind. For example, I have examined rats and have found them infested only with the fleas of mice. A large batch of fleas sent recently from India, and taken from tame rabbits there, consisted, without exception, of rat fleas; and when staying with friends some time ago, I discovered in some stables, at the back of the house, a puppy, apparently belonging to nobody, and literally swarming with fleas. This seemed a golden opportunity, for I was rather short of dog fleas for the purposes of my class, and so I enticed the puppy into the house and up to my room, so that I could flea him without disturbance. To my delight I secured a good handful of fleas, and I have reason to remember that seeing no other preservative available, I put them into my wife's bottle of scent. To my great disappointment, on examining them afterwards, with two exceptions they were *Pulex irritans*,

the flea of man; and it is an interesting point that these fleas were most reluctant to leave the dog, and not one made any effort to transfer its attentions to myself.

The fleas most commonly found on rats are contained in seven genera, and each of these includes species proven to carry plague. But these do not all bite man with equal avidity; *Leptopsylla musculi* bites man reluctantly, and *Ctenophthalmus celticus*, another good plague carrier, will not bite him at all. All species of these genera are not equally hospitable to *Bacillus pestis*, and of the large genus *Xenopsylla*—numbering some forty species if we include *Synosternus*—only one species, *cheopis*, is known to carry plague under natural conditions. And the replacement of *cheopis* by *astia* has been advanced as a reason for the freedom of certain parts of India from plague. *Xenopsylla* is poorly represented in India, where only three species occur, and it is interesting that *astia* appears to be indigenous there, and yet excluded from the dozens of species in Africa, that great home of *Xenopsylla*. *X. astia* has been reported from many parts of Africa, but, as a matter of fact, it occurs only as a restricted immigrant on parts of the East Coast, and the other African records of *astia* probably refer to *X. nubicus*.

The method of carriage of plague by fleas is familiar to all—the obstruction of the proventriculus by a plug of bacilli, and the consequent regurgitation of infected blood by the starving flea in its frantic efforts to feed. That plague is primarily a disease of animals, and that every outbreak of human plague is merely an extension of preceding or concurrent plague amongst animals, are matters of common knowledge. But it is not always remembered that plague is also a true disease of fleas.

The fate of an obstructed flea depends mainly on the atmospheric conditions; in a dry, tropical heat fleas shrivel up and perish quickly, but where the air is cooler, and more moist, obstructed fleas may remain alive and capable of conveying infection for several weeks. In one experiment of the late Mr. Bacot's, a *Ceratophyllus fasciatus* was infected with plague and starved for some six weeks. At the end of this time it was allowed to bite a mouse which forthwith developed plague.

The optimum temperature for plague is about 70° F., and so in tropical countries, where really high temperatures obtain, plague is a disease of the less hot season of the year; but in temperate countries plague is a disease of the summer months, and as winter comes on, with the lessened activity of the fleas, and the lower degree of septicæmia in the rats, plague dies down. It was popular knowledge in England in the old days, that an unusually hot summer was necessary for severe prevalence of plague; but such practical wisdom is found mixed up with abstractions about the appearance of comets, eclipses of the sun, and other high matters of that kind.

In bubonic plague there is usually no evidence of spread of the disease from one person to another, and the most rational explanation seems to be

that the blood of the human subject does not contain the enormous numbers of bacilli usually found in animals, and so fleas which are present have not the same chance of becoming infected. In blood cultures made from fatal cases of bubonic plague, I have found bacilli so sparse that theoretically one could have fed 20,000 fleas on such a case, and yet have infected none. To infect fleas with any certainty from a plague case, one would expect to see bacilli in direct smears of the blood; this would be very rare in bubonic plague, and even in septicæmic plague I do not think that many would recommend direct examination of the blood as a means of routine diagnosis.

I know of no evidence of spread of the disease from person to person in this country in old times. If such infection occurred commonly, it would be difficult to explain why the "Black Death" took a year and a half to spread from the south of England to the middle of Scotland, with armies marching and counter marching, bands of beggars and other masterless men, monks, pilgrims and so on, wandering to and fro. So, too, the London Plague of 1665 took about three months to spread to a serious extent from the present Kingsway into the City. As is well known, pneumonic plague is acutely infectious from one person to another, but it is difficult to determine to what extent this form may have occurred in Europe. It is possible that John of Burgundy refers to pneumonic plague when he says, "From the buboes some recover; from the spitting of blood, none"; it is more probable that he is only referring to the hæmorrhagic form of septicæmic plague. John of Burgundy prefaces his treatise thus: "I, John of Burgundy, citizen of Liège, and professor in the art of medicine, yet, nevertheless, the least of all physicians"—a spirit, I fear, which would not take John of Burgundy very far in consulting practice to-day!

In those old times the prognostic significance of the various plague signs was well known—the fatal import of the hæmorrhages into the skin, called "God's tokens," or shortly, "the tokens," because regarded as betokening impending death. In *Anthony and Cleopatra* Shakespeare talks of "The tokened pestilence where death is sure." Also the good prognostic sign of suppuration of the buboes was common knowledge. Says Defoe, "This was counted the most promising particular in the whole infection, for if these swellings could be brought to a head and to break and run, or, as the surgeons call it, digest, the patient generally recovered." The *Dyall of Agues* records the interesting case of a London woman, the wife of a "certayne Baker" living "without Tempel barre," who, in the epedimic of 1563, had plague on three different occasions, "at Midsommer, and at Bartholomewtide, and at Michaelmas." Of the respective buboes the writer says: "The first time it brake, the second time it brake, but ran little, the third time it appeared and brake not," and she died.

Now I come to some discussion of the history of plague in this country. The earliest invasion of Europe by bubonic plague, of which there is any authentic account, was the Great Plague of Justinian, a devastating

epidemic which swept over Europe in the year 543. Although England must have suffered from this visitation in common with the rest of the Continent, there is no record of the Great Plague of Justinian in this country. We know from the Irish chroniclers that a calamitous epidemic of bubonic plague raged there which, in the words of the Four Masters, carried off "the noblest third of the human race." With plague raging on the one hand on the Continent, and in Ireland on the other, we can be certain that England suffered from a similar catastrophe. The Great Plague of Justinian was called on the Continent the *Lues Inguinaria*—the Groin Disease—from the usual site of the buboes, and it is worth recalling that our ordinary word "bubo" is merely Greek for the groin.

A hundred years afterwards, in the year 664, another great pestilence devastated these islands, the nature of which is not set out in any English record. The Venerable Bede describes the epidemic in his *Ecclesiastical History*, though in terms too general to allow of identification. And neither in the Latin nor in the Anglo-Saxon version of his history is any definitive term applied to the pestilence. But turning again to the Irish records, we learn that this also was bubonic plague, from which two-thirds of the inhabitants of Ireland are said to have perished.

And from this point, down through the Anglo-Saxon, Danish, and Norman times, we hear only faint echoes of plague and pestilence; of dire mortality; of monasteries stripped of their inhabitants by sudden death. A few lines in some monkish chronicle recording that "This year there was a great pestilence amongst the people"; that, "This year there was an unprecedented mortality"; and that, "This year there was a great plague in London." And so on, plague, pestilence and famine; famine, pestilence and plague; till with these, and other miseries, the writer of *An Anglo-Saxon Chronicle* cries out in despair: "Wæs næuer gate mare whreccehed on lande . . . 7 hi sædan openlich ꝥ. Christ slep 7 his haelchen"—"Never was land more stricken . . . and they said openly, that Christ and His Saints were asleep."

Most of these old epidemics were ascribed to hunger, so that the *Anglorum fames* became proverbial—"The affliction of the Normans, the fire of the French, the hunger of the English."

It is likely that some of these old nameless and unrecognizable pestilences were bubonic plague, especially those recorded as causing a sudden high mortality, and accompanied by much panic. But it is unprofitable to theorize about these old unhappy far-off things, and we reach much safer ground with that great universal epidemic of bubonic plague in the fourteenth century, since called "The Black Death." How it came by this name I do not know. The usual explanation that it was so called from the frequency of vomiting of black blood, is not very convincing. The people who passed through the epidemic and saw their friends swept off by the score, did not employ this name, judging from their chronicles; and indeed, I know of no use of the term "The Black Death" within 200

years of the epidemic itself, by which time any symptoms peculiar to that outbreak would have passed beyond popular memory. The old English name for the plague was "The Botch," which means a tumour, a bubo, an excrescence. The term "boss" in the boss of a shield, embossed metal work, etc., is ultimately the same word. "Botch" survives to-day in the dialects of Normandy and Picardy in the form "bosch," a term of abuse, and its application to the Germans during the late war familiarized it to all. It is of interest that the same word in almost identical form, namely, "boss," was a favourite contemptuous epithet with that great master of vituperation, John Knox. In one of his writings, referring to a certain "Bischope"—and John Knox was not very fond of "bischopes"—he says that no one attended to listen to the bishop's sermon except his own jack-men, and "some old bosses of the toune."

To return from this digression—the Black Death spread westwards from Asia, and entered Europe by the Mediterranean ports in the year 1347. It spread northwards, and first broke out in England at Weymouth, in August, 1348. It spread over the southern counties, turning every village into a charnel house, and reached Bristol. The inhabitants of Gloucester made a desperate attempt to isolate their town from Bristol, but without result; they might control the movements of the inhabitants, but the rats were beyond their jurisdiction. The plague spread to Gloucester then to Oxford, and thence to London, where it appeared at Michaelmas of that same year. It raged furiously in the capital, dying down somewhat with the onset of winter. The next year it flared up again and raged all over England, leaving not a village, not a hamlet, scarcely a house untouched. Scotland escaped in the main that year, but not altogether. When the Scots learned of the stricken and prostrate state of their old foe, they thought the time opportune for a massed assault, and assembled an army in Selkirk Forest preparatory to a march into England. But the plague, spreading slowly northwards, smote the Scottish army, of whom some 5,000 perished, a disaster which effectively cooled their warlike ardour, and so impressed them that years afterwards Scottish armies invading England said a special prayer beseeching protection from the plague: "God and Sen Mungo, Sen Ninian and Seynt Andrew scheld us this day and ilka day fro Goddis grace, and the foule deth that Ynglessh men dyene upon." The next year, 1350, the Black Death fell on Scotland with its fullest fury. So the range of the epidemic in Britain extended over three years—the summer of 1348 in London and the south; 1349, all over England; and 1350 in Scotland.

For the best contemporary description of the Black Death we must go to Ireland. A Franciscan monk, John Clyn, of Kilkenny, kept a Latin chronicle, which he called *The Annals of Ireland*, and here, within a short space we have the most vivid account of the Black Death extant. Unlike most Latin chronicles, it is not a mere dry recital of facts, but is a moving and most pathetic document, compiled by one who wrote, as he says, "*Inter mortuos mortem expectans.*" "And I, Friar John Clyn, of

the Order of the Friars Minor, and of the Convent of Kilkenny, wrote in this book those notable things which happened in my time. And I . . . amongst the dead, waiting for death until it come, have reduced these things to writing . . . and, lest the writing should perish with the writer, and the work fail together with the workman, I leave parchment for continuing the work, if haply any man survive, and any of the race of Adam escape this pestilence, and continue the work which I have commenced." He describes briefly, but clearly, the main symptoms of the disease. And many died, he says, from carbuncles and buboes and swellings, which grew on their legs and under their arms; others from a seizure in the head as if turning to a frenzy; others from the vomiting of blood. So great were the fear and dread, that men hardly dared to minister to the sick, or to bury the dead; "scarcely one alone ever died in a house, but commonly husband, wife, children and servants all went the one way, the way of death, and both the penitent and the confessor were carried to the same grave." When poor Friar John Clyn said he wrote as one *inter mortuos mortem expectans,* his foreboding was well founded. His chronicle breaks off abruptly and there is added by another hand: "It is seen that here the author died."

There are no figures which give the total mortality from the Black Death in this country, but the usual computation is that from half to two-thirds of the people perished. Prior to the Black Death the population of Norwich is calculated as 24,000, and after the pestilence it is known that only 7,000 of these were left alive. Records of the Manor Courts exist which show the appalling mortality throughout the country; and a striking feature is that so many of the tenants died leaving neither heirs, nor any blood relation, to inherit their property, the whole family having been wiped out. Law suits came to an end, because no one was left to carry them on. In one case which was proceeding before the courts, out of sixteen people concerned, eleven died of plague. Three Archbishops of Canterbury died within the year. The cause of the death of the first I have not been able to ascertain; the second, John Ufford, died of plague before he was consecrated; his successor, the learned Thomas Bradwardine, arrived at Lambeth Palace, and within a week was dead of plague, with buboes in each axilla. But even in this dreadful time hope continued to triumph over experience, for we read of one good lady who buried three husbands dead of plague within three months.

Since all the chroniclers were themselves monks, most of our exact data are concerned with matters ecclesiastical. It was officially reported to the Pope that in the diocese of York and of Norfolk, two out of every three of the clergy had perished. In East Anglia alone, 800 parishes were left vacant through the death of the incumbent, eighty of these were left vacant twice, ten of them were left vacant three times, and actually several were left vacant four times. In the Abbey of Holdernesse, in Yorkshire, out of fifty monks, forty died; and most of the tenants on the abbey lands

met with the same fate. In Croxton monastery, Lincolnshire, all the monks died except the abbot and the prior. And at Sandon, in Surrey, not a single one of the brethren remained alive. In the words of Gilbert le Baker, a contemporary monk: "Of the common people there died a number beyond calculation; and of the clergy and ecclesiastics a multitude known to God only."

The Black Death was the greatest calamity that has befallen the human race within historical times. It broke up the Feudal System on which the whole political and economic life was based, and altered the history of Europe. The changes wrought by the recent Great War are as nothing compared with the chaos and confusion which resulted from the Black Death. It lies like a great gulf, breaching the continuity of history and tradition.

For over 300 years plague smouldered on in England, every now and then flaming up into a great epidemic. Thus, during the remainder of the 14th Century, after the Black Death, there were four such major epidemics known to the chroniclers as the *Pestis Secunda*, the *Pestis Tertia*, and so on; and this state of affairs continued throughout the 15th Century. During this century, on no less than thirty occasions were one or more of the Oxford colleges either closed, or removed elsewhere, through outbreaks of plague. In May, 1449, Parliament adjourned from Westminster to Winchester because of the plague; six months later Parliament adjourned to Ludgate because of the plague; three months later to Leicester, because of the plague; then to Reading because of the plague; and finally, plague breaking out in Reading, Parliament closed down—which I am quite sure did no one any harm.

Some deaths in one of these numerous outbreaks had a connexion with one of the finest love poems in the English language. I refer to *The Kingis Quair* by James I of Scotland. This monarch, when a boy on his way to France, was taken prisoner by an English ship off Flamborough Head. He was brought to England where he remained in captivity for eighteen years, the greater part of his imprisonment being passed in the Tower. The English politicians of the time were at the age-long game of trying to arrange a marriage alliance with the Scottish crown so as to counteract the French influence in Scotland. A hundred years before, they had married Princess Joan of the Tower to the son of Robert the Bruce. The next century they married Margaret Tudor, daughter of Henry VII, to James IV, from which union came the Stuart succession to the English throne. And now they were determined to marry some one to James I. So with this object, a beautiful girl of royal blood, Lady Joan Beaufort, was sent to walk in the Tower gardens, she, of course, being innocent of any share in the plot. In *The Kingis Quair* James describes how he was looking out of his prison window, watching the birds in the trees and wondering "That I am thrall, and birdis gone at large," when, looking down, he saw the Lady Joan go past.

"And there-with kest I doun myn eye ageyne,
Quhare as I sawe, walking vnder the toure,
Full secretly new cummyn hir to pleyne,
The fairest or the freschest yongë floure
That euer I saw, me thoght, before that houre,
For quhich sodáyn abate, anon astert
The blude of all my body to my hert.

And though I stude abaisit tho a lyte,
No wonder was; for-quhy my wittis all
Were so ouercom with plesance and delyte,
Onely throu latting of myn eyën fall,
That sudaynly my hert became hir thrall,
For euer, of free wyll; for of manáce
There was no takyn In hir suetë face."

—and so on, in the most delightful manner imaginable.

The acquaintanceship thus romantically begun ripened into affection, and finally James Stewart and the Lady Joan were married, in the Church of St. Mary Overy, on 13th February, 1424. Shortly afterwards, King James was set free on promise of payment of a ransom, and he and the Lady Joan returned to Scotland where they were crowned King and Queen of Scots. Now we come to the matter of the plague. As surety for the payment of the ransom, a number of Scottish nobles were sent hostages to London, and while there they fell victims to the plague. James I of Scotland was highly incensed, and to prevent a serious rupture, an English ambassador was sent post haste to Edinburgh to explain that these nobles had not been confined in London, but were free to wander about wherever they pleased, and if, unfortunately, they had fallen victims to the plague, the English Government could not be held responsible. But James had the last word in the quarrel, for he never completed the payment of his ransom!

As regards plague, the history of the 16th Century was that of the 15th Century over again. A foreign ambassador of the period, writing to his government, says that practically every year there are deaths from plague in London, but that ordinarily the people do not concern themselves much about them. But, as we know, every now and then a great epidemic occurred, which startled the people out of their complacency. Thus, during the first half of the century there were epidemics of the first degree in 1500, 1509, 1513, 1531, 1543, and 1547, and some of these are sufficiently interesting to deserve a word in passing. In the plague of 1531 we first hear of the "Bills of Mortality," when the Lords of the Council commanded the Mayor of London to report weekly the number of those who had died of the Plague. Readers of Defoe, Pepys, and similar authors, are familiar with these Bills.

During the epidemic of 1543 was issued the first Plague Order still known *in extenso*. This directs that infected houses are to have a blue cross, and the legend, "Lord, have mercy upon us!" affixed to the door; and that such houses are to be shut up with the inhabitants inside, hale

and sick together, for one month. If for some special reason permission is given for an inhabitant to leave the house, he is to carry in his hand a white wand two feet long, so that he may be known as a plague contact and avoided. Except watch-dogs, all dogs are to be destroyed. There was a strong feeling that both cats and dogs were instrumental in spreading plague, and with good reason. I have attended a case of fatal plague in a European girl infected by a pet kitten; and although dogs are more resistant than cats, still they can easily carry infected fleas in their coats. But people made the great mistake of supposing that man himself was the chief source of infection. The sanitary conditions of the time were ideal for the prevalence and spread of plague. Erasmus, who visited England during this period, describes the houses as he saw them. The floors made of loam, covered with rushes, on which were thrown bones, spillings of beer, vomit and excrement. And this garbage was not removed, but was covered with more rushes, and so on the floors there might be the accumulated filth of twenty years. The houses were over-crowded and ill-ventilated, the streets were blocked with garbage. People were forbidden to throw excrement out of the windows, and were directed to carry down such filth and place it in the streets. Rats swarmed everywhere, and it is important to remember that the common rat was then *Rattus rattus*, which breeds in houses and lives in close contact with man. Fleas swarmed in the houses, and were accepted as a matter of course. Gasgoine, an Elizabethan poet, in a poem where he moralizes and compares sleep with death, regards hordes of fleas in his bed as naturally as he does the presence of the bedding. In this doleful and depressing composition he goes on:—

"My bed itself is like the grave, my sheets the winding-sheet,
The clothes the earth that I must have to cover me most meet.
The hungry fleas that frisk so fresh to worms I can compare,
That greedily will gnaw my flesh and leave the bones full bare."

And even 100 years later, Samuel Pepys records that having to spend a night in an overcrowded inn, he shared a bed with one, Master Clark, who, he says, did "attract all the fleas to himself, to my exceeding relief." It was not the presence of the fleas which was noteworthy, but merely that they found Master Clark the more attractive, and Samuel Pepys was left in peace. Another poet, John Donne, when paying court to a lady, noticed a flea hopping from her to him. He was so moved by the bond of union thus constituted that he wrote a very pretty sonnet about it, ending up with this engaging thought: "And in this flea our two bloods mingled bee."

With the houses constituting a paradise for rats and fleas swarming and tolerated as these quotations show, is it any wonder that plague flourished?

About this period we find a most interesting publication, entitled, *Ane Breve Description of the Pest* by Gilbert Skene, professor of medicine

in Aberdeen, and physician to James VI of Scotland. So far as I know, this is the first book published in this country by any physician dealing with plague and based on his own personal knowledge and observations, earlier writers having been content to translate from continental authors, or to plagiarise from the ancients. It is an excellent production. He says: "the cause of pest in ane Citie is stinkand corruptioun and filth quhilk occupeis the commune streittis and gaittis." He noted that many animals die of plague, and considered it a bad sign when the "Moudewarp and Serpent leavis the Eird [earth] beand molestit be the vapore contenit within the bowells of the samin." By "moudewarp" he means moles —a fine old word found in every Teutonic language, and surviving in classical English beyond the time of Spenser and Shakespeare, both of whom use it. I understand the word lingers on in Scotland,[1] where no doubt the schoolmasters, after the manner of their kind, will soon lay it by the heels. It is more difficult to determine what Gilbert Skene meant by "Serpent," for a writer on zoology of his time includes under the elastic heading of "Serpents" such diverse creatures as Crocodiles, Toads, Spiders and Bees. The late Mr. BACOT, in one of his papers, pointed out that certain fleas of hens can carry plague, and suggested that the occurrence of the disease amongst these birds would be fraught with much danger to man. But Gilbert Skeene was some 400 years ahead of Mr. BACOT. He says this "infectioun bringis baith man and beast to death, the soner gif [if] sic incressis of lang tyme, and speciallie quhan the Domesticall foulis becummis pestilentiale it is ane signe of maist dangerous pest to follow, because quhan the beist is infectit mekil mair sall the man."

During the Plague of 1563, the recorded deaths in London—always much less than the true deaths—rose to 2,000 in the week, and Stratford-on-Avon, where a small infant, William Shakespeare by name, was then living, lost one-seventh of its inhabitants from plague. The Shakespeare family escaped the plague on this occasion, and we find the poet's father, John Shakespeare, then an Alderman and a person of substance, subscribing liberally towards the relief of those left destitute by the plague. The earliest mention of John Shakespeare's name in the records of Stratford-on-Avon occurs a few years earlier, when he was haled before the magistrates and fined the sum of twelve pence for having at his door an accumulation of filth which offended even the seasoned nostrils of his neighbours. It is possible that John Shakespeare profited from this salutary lesson, and in consequence the Shakespearean rats may have departed for other premises —as rats do—where the owner's natural inclination to harbour filth had not been hampered by the operations of the law! Shakespeare was very familiar with plague, and makes many references to the disease in his plays. Twice he refers to the skin hæmorrhages—then called the tokens—as

[1] Several members of the audience informed the speaker, after the meeting, that "Moudewarp" is still used in English dialect.

presaging death—"The tokened pestilence where death is sure"; and, "the death tokens . . . cry 'No recovery.'" Again, in a figurative allusion to the Plague Orders, he says, "Write 'Lord have mercy on us,' on these three . . . they are infected; they have the plague." Shakespeare had good reason to be familiar with plague, for he suffered many things because of it. An Order of the Privy Council directed that the London theatres were to be closed in any week that the plague deaths reached thirty, and on many occasions Shakespeare was driven from London by the operations of this Order. There is a hit at this most unpopular Order in Middleton's *Five Gallants*, where one of the characters says, "'Tis e'en as uncertain as playing, now up and now down, for if the bill do rise to above thirty, here's no place for players." During the Great Plague of 1603, the London theatres were closed for a prolonged period, and we find Richard Burbage's company—that is, Shakespeare's—producing six plays at Hampton Court Palace where James I was in residence, having been driven from London by the plague. And a few months later, James I —always a patron of the drama—subscribed thirty pounds—about £300 to-day—towards the relief of distress in Burbage's company through the prolonged closing down of the London theatres.

In the epidemic of 1603, we meet with a delightful example of the strange workings of the official mind. Presumably there had been complaints of the Government's failure to check the spread of the pestilence, and so the Plague Order for that year directs that the cross affixed to the doors and the legend "Lord have mercy upon us," previously blue were to be changed to red, and the wands carried by the contacts, previously white, were to be altered to red also. No doubt the official responsible for this happy inspiration congratulated himself on his resource, but we do not find that the red crosses checked the plague any more effectively than the superseded blue crosses had done.

For several years after the great epidemic of 1603, plague in London remained at a high endemic level, and all the theatres were closed from July to December in each of the five years, 1606 to 1610. During this period of enforced rest Shakespeare seems to have retired to Stratford-on-Avon, and the production of his play *Macbeth*, written to celebrate the accession of James Stuart to the throne, was postponed for some seven years. It is interesting to observe that Shakespeare was enough of the courtier to alter the story of Macbeth. As he found it in Holinshed's Chronicles, Banquo was as much concerned in the murder of King Duncan as Macbeth was, whereas in the play, Banquo is a noble-minded and high-souled man who falls a victim to the blood-thirsty Macbeth. Presumably Shakespeare canonized Banquo because he was the ancestor of the Royal Stuarts, and it would hardly have been politic, in a play celebrating their succession to the crown, to have held up their ancestor to obloquy as a murderer.

Between 1611 and 1624, we hear very little of plague, except for a few

minor outbreaks in the provinces. But in 1625 there occurred an epidemic of the first magnitude during which the recorded plague deaths in London rose to 4,000 a week, and for the next forty years this outbreak was known as "The Great Plague of London," until that of 1665 effaced it from the popular memory. I do not propose to talk about the plague of 1625, because everything of interest this year was repeated in the epidemic of 1665. In the interval between these two outbreaks, plague was present constantly in London, and deaths from the disease are recorded for practically every one of the intervening forty years.

This brings us to the Plague of London of 1665. This is often known as "The Great Plague of London," though it was no greater in proportion than a dozen other outbreaks. It is often foolishly called "*The* Plague of London"—as if there had never been any plague in London except the one. It is certainly the best known, partly because it was the last, and also partly from the popularity of Defoe's *Journal of the Plague Year*, although it is worth remembering that Defoe witnessed the epidemic only as a small child four years old.

In 1665, the City was still the chief residential district of London, and though many of the open spaces had been built over, there was not the same squalor, overcrowding, and filth existing in the City as was found in the Liberties and out-parishes beyond the walls. These were slum areas covered with hovels and tenements, and traversed by mazes of winding lanes and alleys. In the Liberties and out-parishes, the epidemics of 1603 and 1625 first broke out and raged most fiercely, and this history was repeated in the Great Plague of 1665. Contemporary writers spent much energy in an attempt to trace the source of this last of the London plagues, some seeing it in bales of goods from Holland, others in ships from Turkey —a futile inquiry when we know that plague had been present in London constantly for the past forty years. According to reports of the time, many deaths from plague were occurring at the end of 1664-5, in the Parish of St. Giles' in the Fields—through which the modern Kingsway runs—but these plague deaths are not found recorded in the Bills of Mortality. Over this period, however, the total London deaths recorded exceed the normal, the increase probably being plague deaths, concealed in Defoe's words, "by knavery and collusion." By the end of May the deaths in St. Giles' were too numerous to permit of further concealments, and this district continued to bear the main brunt of the outbreak until the middle of June. All this time the plague was spreading slowly eastwards, along Holborn and the Strand, and through Westminster, but the City proper was still but little affected by mid July. By the end of August, plague had died down in the western parishes, and was raging at its fullest fury in the City. There was the usual stampede of all who could fly. The Court left London in June, finally arriving at Oxford, and for weeks all the roads leading from London were crowded with pedestrians and horsemen, flying from the wrath to come. Many of the clergy deserted their charges and sought safety in

flight, so that the Cromwellian ministers who had been deposed at the Restoration came out and preached openly in the City churches; an enormity which so hurt the tender conscience of the Merry Monarch, that he sent a letter upbraiding the authorities for their laxness in permitting such an outrage—a letter which would read much better if it had been addressed from Our Palace of Whitehall, and not from Oxford.

These fugitives spread terror and consternation wherever they went, and those lacking some shelter or habitation of their own found every village, every house, barred against them. Armed men patrolled the roads and tried to drive the fugitives back to London, so that numbers perished along the highways and hedges; and so strong was the feeling against them that some of these poor wretches were even denied Christian burial.

Some of the Court party remained in the stricken City, cheering and enheartening others by their courageous bearing. Amongst these, as one would expect, was stout-hearted George Monck, Duke of Albemarle, who had set Charles Stuart on the throne, and who assumed control of the Liberties and out-parishes which lay beyond the authority of the City of London.

The Lord Mayor, Sir John Lawrence, and the Aldermen, remained gallantly at their posts, and saw to the enforcement of the various orders, arranged for the compulsory baking of bread—the bakers, 200 years ahead of their time, threatening a strike—and superintended the distribution of relief. These functionaries did not spare themselves, and every market day the Lord Mayor, or one of the Sherriffs, went down through the market place—to their idea taking their lives in their hands—so as to give confidence to the country people who still ventured to bring supplies into the town, and so help to avert the threatened famine. Considering the sea of troubles which faced these authorities it is difficult to see how they could have managed better than they did. A stranger descending on London at this time would have seen that something very grievous was amiss; multitudes of houses deserted and closed up, grass growing on the streets, sounds of lamentation everywhere, but he would hardly have guessed that over a thousand people dead of plague had been buried the night before, and that a thousand more dead of plague would be buried that night too. So as to lessen the outward and visible horrors of the times, as far as possible all funerals took place at night; the dead-cart went its rounds accompanied by criers, ringing a bell, and calling on the people to bring out their dead. The corpses were taken by bearers, carried to the cart and tipped into the nearest plague-pit, where they were covered over with earth before morning. In the case of those who fell down and died in the streets—as often happened—the bodies were covered with a cloth by the searchers, or removed to some city churchyard, where they lay until the cart came its rounds after dark. And in sad contrast to these rude attempts at decency, the poor creatures dying thus in the streets, usually had their pockets picked, or even their clothes stolen, before the breath was out of their bodies, so hardened and callous had the times become.

As in former epidemics, the quarantine of houses was the main preventive measure adopted by the authorities. Examiners and searchers reported cases of plague and the infected houses were shut up, with their inhabitants inside—sick and well together—for one month, and guarded by watchmen night and day ; and to add to the horrors of this useless quarantine, the poor creatures so imprisoned were often robbed, sometimes even murdered, by the vile wretches who were supposed to guard them. But when the recorded deaths had risen to over a thousand a day, this system of quarantine broke down, because the infected houses were too numerous to watch. Cats, dogs and swine were forbidden in the City, and thousands of cats and dogs were slaughtered by especially appointed killers, and multitudes of rats destroyed by poison. The people believed that these animals absorbed the effluvia of plague from the dead bodies and carried the infection in their coats and fur. They were coming very near the truth, but they still made the great mistake of supposing that man himself was the chief source of infection. This was the official view, and it was generally accepted ; but even at this time, a dissident minority pointed out that those in attendance on the sick suffered no more, and indeed were usually affected less, than the rest of the population.

Two schools of sanitarians wrangled regarding the utility of lighting fires in the streets to purify the air of plague. One section condemned the fires utterly, the other upheld them just as vociferously. But the faction favouring fires was itself rent in twain, as to whether the fires should be of coal or of wood. And the party favouring wood was still further subdivided as to which particular kind of tree possessed these mysterious anti-plague properties in the largest amount. Till, the heavens growing weary of these futilities, rain fell in torrents and put the fires out, and the Lord Mayor, having more sense than the disputants, refused permission to have them lighted again.

During November, the fury of the plague abated, and by mid December the deaths had fallen to one-seventh of the number recorded a month previously, but plague continued in London throughout the whole of the next year. During 1665, in London the total number of deaths recorded from plague was 70,000, a figure which greatly understates the true mortality, because, to escape the horrors of quarantine, deaths, when possible, were recorded under some other heading. For example, the number of deaths returned from malaria this year was an absurd figure of over 5,000. And owing to the general chaos and confusion many deaths were never returned at all.

During 1665 and 1666 there were many outbreaks of plague in England, and Colchester experienced what is described as the worst epidemic of any provincial town since the Black Death ; and in 1667 Nottingham suffered from a very severe outbreak, the last of its kind in England.

Following the epidemic of 1665, plague smouldered on in London, and deaths from the disease were recorded for the next thirteen years. But

after 1679 we hear of them no more, and some twenty years later the heading "Plague" was removed from the Bills of Mortality, and here ended the sad, eventful history of endemic plague in Britain.

Why did plague disappear? Probably several factors were concerned. First, the development of a sanitary conscience among the people created an environment unfavourable to plague, which is a disease of low civilization, of filth and overcrowding. No epidemic of plague in England ever began otherwhere than in the slums of some town, and any involvement of the country was always secondary to this urban infection. This was common knowledge for hundreds of years. The unknown author of the old ballad *Bessie Bell and Mary Gray*, describes how these girls, flying from the plague, built for themselves a bower beside a country stream :—

> "They biggit a bower of rushes green,
> And thekit it with heather—
> But the pest came from the borough-town
> And slew them both together."

We can be quite sure that "the pest came from the borough-town," and we can be equally certain that the borough-town was a dirty one.

It is usual, in this connexion, to give credit to the Great Fire of London, which is supposed to have scorched and burned plague out of existence. But this is not so, because the Parish of St. Giles' in the Fields, and the adjoining parishes and Liberties, the perpetual home and head-centre of plague, were not affected by the Fire at all. But the Fire of London had two very far-reaching indirect results. The Rebuilding Act of 1667, so as to lessen the danger of further conflagrations, forbad the use of lath-and-plaster houses in London, and directed that the walls of all houses must be built of brick or stone. This sealed the doom of the house-haunting *Rattus rattus*, a species which normally does not burrow, and which, in a climate like ours, is dependent for its continued existence on shelter provided by man. It could not cope with brick and stone walls, and driven outside, it met with the rigours of our climate, and later came into competition with the much hardier *Rattus norvegicus*, the common rat of to-day. Goldsmith, writing in 1774, says that the black rat used to be called the "common rat," but it "is now common no longer." If the dates given for the introduction of *Rattus norvegicus* are correct, endemic plague had then been absent from England for over forty years.

Rats in those days swarmed in numbers which seem incredible to us to-day. One writer records that when staying at an inn opposite a tan-yard, he noticed one evening the carcases of thirty-six horses, stripped of their hides, thrown into the street—such being the simple method of disposal then adopted. And next morning he was interested to see the bones of the thirty-six horses picked absolutely clean and bare by the rats. And later, in Paris, when it was proposed to remove certain tan-yards, the people of the district protested to the Government and begged that the tan-yards should be left, asserting that if they were removed the rats deprived of

their usual food supply would turn on the inhabitants and devour them alive!

The second important section of the Rebuilding Act placed under a central authority all the scavenging and sanitary measures which previously had been carried out, or rather left undone, by the parishes themselves. This caused an immense improvement in the general sanitary condition of the streets, but even this altered condition would be very shocking to the ideas of to-day. But most important, as already stated, all this time the people were developing a sanitary conscience, and the conditions necessary for the prevalence of plague—filthy houses swarming with rats and fleas—were no longer tolerated, and so the great plagues which scourged Europe in the 18th Century left our shores untouched.

I fear I have already expended the alloted hour and a quarter, this time being the minimum for which I could decently be asked to speak, and the maximum that the fortitude of the audience might reasonably be expected to endure, so I must bring my discourse to a conclusion.

There are tens of thousands of people in this country who have heard, on innumerable occasions, the petition in the Litany beseeching deliverance from plague and pestilence, without comprehending, even dimly, what these words, plague and pestilence, would have conveyed to the petitioners only seven generations ago. If such people had only a little more knowledge, a little more imagination, they could understand for themselves the agony endured by the poor souls who uttered this petition, just as Friar John Clyn wrote his chronicle, *inter mortuos mortem expectans.* And having visualized this, they would then realize the horrors which they themselves have escaped through the operations of hygiene and preventive medicine.

The CHAIRMAN: Colonel MAC ARTHUR has given us an address of unique interest; I never remember having passed an evening here so pleasantly, or so quickly. We are the more indebted to him because the speaker whom we had expected this evening unfortunately failed us, and Colonel MAC ARTHUR came to our rescue at short notice. We had no copy of his paper, and we had no idea what he was going to tell us. Our confidence that we should spend a pleasurable and profitable evening listening to him, has been fully justified. I think his address was of such exceptional interest partly because he chose to tell us of matters which are not to be easily found in the plague literature of old times. I spent half an hour this afternoon in the London Library looking up some of those old records, and I cannot remember having found one of the references which Colonel MAC ARTHUR has brought to our notice. I did, however, find an account which I may mention in reference to Colonel MAC ARTHUR's remarks about the lady who managed to bury three husbands. I found the record of a man named Marshall Howe, who lived in a small village in the Peak district. He was said to be a man of gigantic stature and undaunted courage who undertook to do the burials for this small village. He did

27

burials of several hundred people. And during the period that the Plague lasted in this village he buried his own wife and two sons, married another wife and buried her too. Every time he buried anyone he took all their belongings and all the things in their houses. It is recorded that for a generation or two after the Plague the family people in that village used to bring their children to obedience by threatening to send for Marshall Howe. We shall be glad to hear any further historical points on this subject.

Dr. T. P. BEDDOES, in proposing a vote of thanks, seconded by Sir HARRY WATERS, to Colonel MAC ARTHUR, described the address as the most eloquent he had heard from any medical man in any language.

Dr. P. H. MANSON-BAHR and Dr. C. M. WENYON, having spoken, the CHAIRMAN said: There are two propositions; one is a vote of thanks to Colonel MAC ARTHUR for his admirable lecture; the second is that he will allow the substance, or if possible, the words, of this address to be printed in the TRANSACTIONS. There is a very good reason for this, because Fellows who live abroad will not know anything about the address unless we print it in the TRANSACTIONS. Therefore, it is very important that we should endeavour to persuade Colonel MAC ARTHUR to allow us to do so.

Colonel MAC ARTHUR, in response to the cordial expression of the vote of thanks, put by the CHAIRMAN, explained the reasons for his reluctance to agree to publication of his address with, perhaps, the little virtue it managed to acquire in delivery clean gone out of it in cold print.

It might well, he felt, be like the story of the shipwrecked sailor, a thirsty soul, who to his inexpressible emotion saw floating into his little creek a seemingly unopened bottle of beer. With an infinitude of exertion he got into juxtaposition to the prize. But prose was inadequate to describe the sequel, and so Colonel MAC ARTHUR fell back on the words of the poet:—

> "'Tis an old Bass bottle comes floating from the sea,
> 'Tis an old Bass bottle comes floating unto me;
> And inside is a message with these words written on:
> 'Whoever finds this bottle—finds the beer all gone!'"

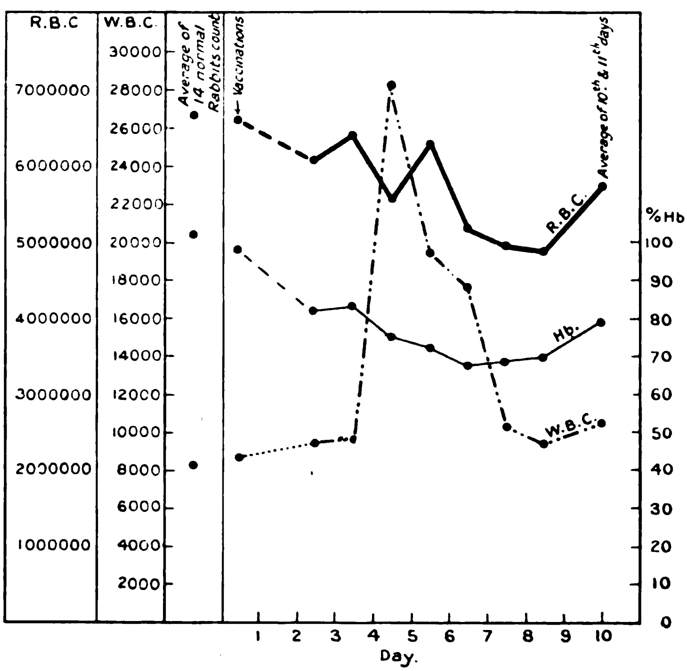
BLOOD CHANGES IN RABBITS AFTER VACCINIA INOCULATION.

By T. G. M. HINE, O.B.E., M.D., M.A., etc.,
Late Hon. Major, Royal Army Medical Corps.
From St. Bartholomew's Hospital.

The blood changes following small-pox and vaccinia have not attracted the attention they deserve; at least with reference to the red blood-cells, especially in rabbits.

Professor W. H. Hoffmann (Havana) contributed a paper to the

Chart I.—Daily Average R.B.C., W.B.C. and Hæmoglobin of Ten Rabbits. (Hæmoglobin only, Eight Rabbits.)



Note.—Injection after first day's count.

Münchener medizinische Wochenschrift, August 10, 1923, vol. lxx, No. 32, on the blood changes in small-pox, in which he shows the results of his work on some two hundred rabbits, but almost entirely on the leucocytes, dismissing the red cells in a few words, stating that in some he found a lowering of eighteen to twenty per cent. The object of his paper is

mainly diagnostic, and he speaks throughout of variola, though he probably used vaccinia virus (not distinguishing between them), because the rabbit's skin is insusceptible to variola but yields a typical reaction to vaccinia.

When inoculating rabbits with vaccinia virus some time since, it was thought well to ascertain whether there were any blood changes among the cellular constituents. Accordingly several rabbits were first examined to ascertain the normal counts, and also all rabbits which were vaccinated had a count taken immediately before inoculation.

In making these counts 400 squares at least were counted in three to four slides for the red cells, and similarly 2,000 squares for the whites. In the differential counts at least 500 cells were classified, and generally 1,000. The hæmoglobin was taken from the average of two estimations, unless there was considerable difference between these, when more were done.

Examining first the mean normal counts, the red blood corpuscles averaged 6,700,000, and the white 8,100. The mean of the hæmoglobin estimations was 102 in ten rabbits. The cell-count was done in fourteen animals.

CHART II.—COUNT OF R.B.C., W.B.C., HÆMOGLOBIN AND DIFFERENTIAL WHITE OF RABBIT H, 4TH TO 14TH DAY.

	Red blood cells	White blood cells	Per cent Hb.	Percentage					Remarks
				Poly-morph.	Lympho-cytes	Large mono-nuclear	Eosino-philes	Baso-philes	
1st day	6,854,000	6,080	102	34·8	55·6	4·4	—	5·2	No bilirubin in blood
4th ,,	8,056,000	8,000	100	40·8	50·4	5·2	0·8	2·8	Trace bilirubin (0·4 unit) in blood
5th ,,	4,760,000	27,540	85	82·3	13·2	2·2	0·2	2·1	10 normoblasts per 1,000 white cells. 0·6 unit bilirubin
6th ,,	5,712,000	11,560	75	68·4	23·6	5·4	—	2·6	74 normoblasts per 1,000 white cells. 0·2 unit bilirubin
7th ,,	5,310,000	13,480	70	31·0	57·8	9·0	0·2	2·0	32 normoblasts per 1,000 white cells. 0 5 unit bilirubin
8th ,,	3,792,000	15,720	65	43·4	38·0	16·6	—	2·0	10 normoblasts per 1,000 white cells. 0·2 unit bilirubin
11th ,,	5,224,000	11,680	65	41·8	39·8	15·2	0·8	2·4	6 normoblasts per 1,000 white cells. No bilirubin
14th ,,	4,080,000	6,840	73	56·2	28·8	11·4	0·2	3·4	2 normoblasts per 1,000 white cells

(*Note.*—1,000 white cells counted each day.)
On 6th day the polymorphs appeared to be of a younger type than before, with few lobes.

The mean count of the ten rabbits before the vaccination was red blood corpuscles 6,600,000 and white blood corpuscles 8,500, with hæmoglobin 98 per cent. Few differed very much from the average, except in the differential counts, when there were found large differences between the proportion of polymorphonuclears and lymphocytes.

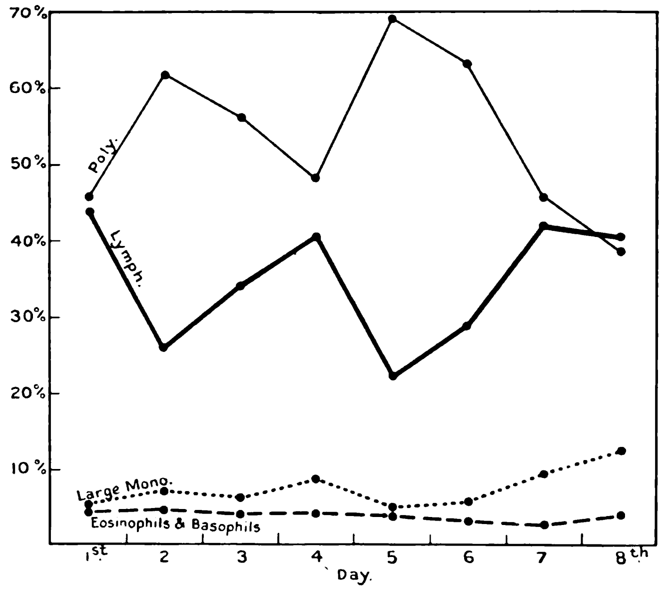
One rabbit had a red count of 8,520,000, however, and another had only 5,650,000, but the others were nearer the mean.

Chart I shows the average counts on each day from the first to the eleventh. Nearly every rabbit, however, had one or two counts missing, owing to Sundays or other causes, but as these rarely fell on the same day it should make little difference in the mean results.

Chart II shows a typical complete blood-count from the fourth to the fourteenth day, missing out the ninth, tenth, twelfth and thirteenth days, as the changes after the eighth day are small.

Chart III shows the mean percentage differential count of eight rabbits, but the changes in the numbers of the white cells are best seen in the table, which shows the absolute count in three rabbits.

Chart III.—Percentage Differential (Mean) Blood Counts of Eight Rabbits.



The skin reaction in rabbits begins about the fourth day, is at its height between the seventh and eighth, and then slowly subsides.

An examination of the individual blood-counts shows that almost from the commencement there is a hæmolysis which manifests itself by a fall in hæmoglobin of about 30 per cent by the seventh day, and which is already about 20 per cent by the third day. The largest fall attained was 55 per cent in one rabbit, and about 65 per cent in three others; while the smallest fall was down to 72 per cent of hæmoglobin in one rabbit, the figures being the scale readings.

Concurrently with this fall in hæmoglobin there is a drop in the red count, the average loss being one and a half millions, the greatest fall being from 6,800,000 to 3,790,000.

That real hæmolysis occurs is proved by the finding of bilirubin in the

blood which is normally absent in rabbits. Dr. C. H. Andrewes very kindly estimated this for me in two rabbits, one having 0·6 unit from the third to seventh day and the other showing 0·6 to 0·4 from the sixth to eighth day, and finally got clear after the eleventh day. These are, of course, not large amounts, but they serve to show that real hæmolysis occurs fairly early.

An invasion of the blood by normoblasts occurred in nearly every case. This began about the fourth day, and was most apparent from the sixth to the eighth day. It amounted in three of the rabbits to as many as 90, 74 and 68 normoblasts per 1,000 white cells.

Turning to the leucocytes, it will be seen that there is a definite leucocytosis between the fourth and eighth days. The differential counts disclose, however, that from the third to the fifth day this is mostly polymorphonuclear in type. This then rapidly decreases, but is met by a rise in the lymphocyte count which prolongs the leucocytosis, or at any rate prevents the fall being so abrupt. The following table shows the absolute number of leucocytes, polymorphonuclears and lymphocytes respectively per cubic millimetre of blood, in three rabbits, from the fourth to the eighth days.

TABLE.

Day	Rabbit C		Rabbit F		Rabbit H	
	Poly.	Lymph.	Poly.	Lymph.	Poly.	Lymph.
1	6,720	3,960	3,577	3,197	2,088	3,336
4	6,608	3,540	4,512	3,916	3,264	4,032
5	30,688	8,736	10,227	2,502	22,632	3,630
6	21,469	16,857	6,400	4,939	9,866	2,714
7	10,640	5,928	5,434	6,162	4,185	7,803
8	3,240	5,713	8,036	7,710	6,813	5,966

CONCLUSIONS.

(1) In the rabbit after cutaneous inoculation with vaccinia virus there is a well-marked hæmolysis with bilirubin in the blood, an invasion of normoblasts and loss of red corpuscles and hæmoglobin, chiefly between the third and eighth days.

(2) There is a polymorphonuclear leucocytosis beginning about the fourth day and followed by a definite though not so great a lymphocytosis about the sixth or seventh day.

(3) The whole reaction is over about the eleventh day, but sometimes the anæmia continues in a small measure for a period of a month or so.

LEPROSY, WITH SPECIAL REFERENCE TO PROGNOSIS.

By Dr. R. G. COCHRANE.

Medical Secretary, Mission to Lepers.

Being the substance of a Lecture delivered before the Siamese Medical Association in December, 1925, at Bangkok.

Within the last half dozen years our views on tropical medicine have been revolutionized. Great advances in our knowledge have been made, and the advance in the field of leprosy has been one of the most dramatic. From an incurable malady, the spread of which it was almost impossible to prevent, leprosy has become to some extent both a curable and a preventable disease. This being the case, it is all important that we should study the disease, especially with regard to its treatment and prognosis.

Before dealing with the question of treatment, we must consider first the ætiology and signs and symptoms of leprosy. Leprosy is caused almost certainly by the *Microbacterium lepræ* (Hansen, 1874), although this bacterium has never been definitely cultivated, and has not been proved by experiment to be the causative organism, yet it is universally present in all cases of leprosy.

The *Microbacterium lepræ* does not seem to be so pathogenic to man as the allied organism of tuberculosis, and therefore the disease runs a much more chronic and protracted course. It is impossible to be certain of the exact method of transmission of this disease, as all attempts have failed to cultivate the organism and to infect animals. Certain factors are most probably necessary before the bacillus will produce the disease in man. To acquire leprosy one needs to come into close and prolonged contact with an individual in the infective stage of the disease. There is probably another factor which is just as important, if not more so, and that is some predisposing cause which lowers the vitality of the individual. The evidence which is accumulating tends to show that a healthy man, provided he does not come into close contact with the disease, should not acquire leprosy. This then is a possible explanation of the long incubation period of the disease. The *Microbacterium lepræ* may be introduced into the body but may lie latent in some tissue space or lymphatic gland, and if at any future date the health of the patient is lowered, the disease may then manifest itself. Certain factors are more important than others in thus preparing the body; among these are syphilis, hookworm disease, chronic malaria, and constipation, but any debilitating cause will predispose to the acquirement of the disease. The age of the individual is an important factor. Although the bacillus can be found in the placenta of the mother and in the umbilical cord of the infant, as shown by recent work in the

Philippines, the child at birth does not acquire the disease; but after the first year of birth the susceptibility of children increases very greatly, and between the ages of 3 and 20 this susceptibility is comparatively great; after 20 the body becomes gradually less susceptible.

Let us now pass on to the signs and symptoms of leprosy. Before discussing symptoms in detail it is necessary to remember that leprosy is a self-limiting disease; that is, it runs a prescribed course which varies with each individual, but, unlike many other diseases, it rarely kills the patient. Instead, if the disease continues to the ultimate end, as it usually does in the untreated individual, it leaves the patient deformed and mutilated. In the course of the disease nerves and other tissues are destroyed, and although the disease has died out, deformities and ulcers continue to form as a result of nerve destruction. In India, and apparently in Burma and Siam, the earliest indications of the disease are signs of nerve involvement; it is not until later, in the majority of cases, that skin manifestations appear. It is not infrequently noticed that when the skin symptoms appear and intermittent attacks of fever occur more frequently, the nerve symptoms tend to subside, and in some cases the anæsthesia clears up completely. The subsequent course in such a case, if untreated, is that the skin symptoms become worse and worse, nodules appear and the patient becomes more and more infective; he may be described as on the ascent of a curve, "the course of the disease being represented by a parabolic curve" [1]. Ultimately the patient reaches the point of maximum infectivity (this varies in different individuals) and the body begins to overcome the infection. That is, the patient reaches the crest of the curve, and as he descends the disease begins slowly to subside, skin symptoms disappear, nodules and rashes tend to clear up, and where nodules were wrinkling of the skin takes place. Along with these changes secondary reactions set in which lead to the formation of fibrous tissue. One of the most marked changes in this stage is the formation of fibrous tissue in the nerve-sheath of the affected nerves which contracts down, destroying the nerve-fibres and probably also destroying the bacilli in the nerve. As a result of this nerve destruction trophic ulcers and contractures of muscles occur. If the ulcers are uncared for they progress and extend, involving the deeper structures and bones. The leper has now entered the secondary anæsthetic or "burnt-out" stage. Such lepers are no longer infective for the disease has completely died out, but as they are a nuisance to society and in the uncared-for state are the most miserable of men, they should be isolated in homes.

Some authorities suggest that the initial leison in leprosy appears at the site of inoculation of the bacilli, and that the nerves are affected by an ascending infection from this site. Others maintain that the bacilli lie latent in the body, possibly in the lymph glands, and that surgical trauma or some other factor devitalizes the tissues and then the lesions in leprosy appear. This question I shall not discuss. The first indications

of the disease are generally signs of nerve involvement. The earliest signs take the form of (1) depigmented patches, and (2) anæsthesia; both these may appear simultaneously. Sometimes these signs are preceded by vague aches and pains of a rheumatic nature.

Depigmented Patches.

These appear on the outer sides of the body, the outer side of the arm and the leg, the buttocks, and, in fact, all those places which are exposed to pressure, and also exposed to the contact of infective bedclothes, etc. At first these depigmented patches are not anæsthetic, later they may become so. The patches are light in colour but never white, in a dark skin they frequently become a coppery colour. Sometimes this is the only sign that a patient has got leprosy, and therefore it is important to recognize it. As aids to diagnosis one can state that they are on the outer and exposed parts of the body and face, they are light in colour, but never white, and they have a smooth surface. The commonest depigmentation with which it could be confused is that of pityriasis versicolor; the distinction is easy when once recognized, but it is better seen than described. Pityriasis has an irregular surface and an appearance of a tinea, it is not commonly widespread over the body and trunk, and does not pick out so characteristically the outer sides of the limbs and the face. Any depigmentation in a person with a history of leprosy in the family should be looked on with suspicion. The second sign of leprosy is anæsthesia, associated with this the nerve involved may or may not be thickened. The anæsthesia is very superficial at first, therefore any method which tests pressure and not tactile sensation will fail to detect the disease. The best method is to fold a piece of paper into four parts and test anæsthetic areas by lightly stroking the skin, while the patient with his eyes shut indicates the area touched with his index finger [2]. The appreciation of painful stimuli and and of slight variations in temperature are affected first, but these can only be tested out in intelligent patients [3]. The nerves that are commonly involved are the ulnar, peroneal, great auricular and facial. It should be remembered that facial nerve involvement gives paralysis and not anæsthesia. The involvement of the great auricular nerve shows itself by thickening and not anæsthesia. The diagnosis of nerve leprosy should be easy, if it is remembered that the only common disease in India to give anæsthesia to superficial touch is leprosy. Any case which shows thickening of a superficial nerve should be looked upon with suspicion, and careful tests applied to exclude leprosy. It should be remembered that nerve leprosy is not infective, and that such a case can carry on his employment without let or hindrance provided that he is treated and kept under observation.

Having considered the diagnosis of early nerve leprosy, let us now pass on to the consideration of skin leprosy In India many cases commence as pure nerve cases, but if untreated pass on to the skin stage. Skin

leprosy does not necessarily manifest itself by the patient developing nodules. The first evidence may be the appearance at the periphery of a depigmented or anæsthetic patch of raised erythematous rash. This being the case, it is necessary to consider the differential diagnosis carefully. It is not uncommon to find that skin leprosy at this stage is often misdiagnosed; the commonest mistakes in diagnosis to be made are the following: ringworms of all sorts, tertiary syphilis, psoriasis and the various erythemas, but in addition it may be diagnosed as lichen planus, and even skin sarcomata. The crux of the diagnosis rests on the finding of the *Microbacterium lepræ* in the serum expressed from the cut surface of the periphery of the suspected rash. To examine for bacilli one can either take a clip from the raised edge of the patch with a pair of scissors curved on the flat, or else make an incision in the periphery and take a scraping, examining the serum exudate in both cases for bacilli. No suspicious case should be discharged without a thorough nasal examination, and if a swab does not reveal bacilli, scraping with the edge of a scalpel may be more successful. If bacilli are found, then the diagnosis is placed beyond doubt. It should be remembered that skin leprosy is not an irritating disease, like many other skin conditions. Because skin leprosy is protean in its manifestations, any lesion in the skin which presents a red raised appearance should be looked upon with suspicion.

Having briefly described the signs and symptoms of this disease let us now turn to its treatment. In the first place, before considering treatment in detail, one must remember that when a leper has reached the top of the curve the tendency is for him to improve, no matter what treatment he receives. The rapidity of the improvement depends on the care which is taken to see that the patient is placed in good hygienic conditions. Hansen was aware of this when he said, as far back as 1895, " gradually all specific lesions disappear and the patient is healed from his leprosy " [4].

Leprosy being a chronic disease and one of long duration, the success of one's treatment does not depend altogether on any specific remedy, but depends largely on the care one takes in looking after the general condition of the patient. Therefore, before one considers specific treatment one must dwell on the general treatment. In considering the general condition of a patient one should ask himself five questions.

(1) *Is there any Predisposing Disease?*

As explained, predisposing diseases play a large part in the acquiring of this disease. Therefore, until such diseases as syphilis, hookworm and malaria are attended to, the specific treatment has little chance of success. The injections of hydnocarpus oil or ester can be given while the patient is being treated for some concomitant ailment. It is advisable, however, to withhold the injections while the courses of N.A.B. are being given for syphilis, for N.A.B. itself is liable to produce reactions; but during the subsequent mercurial course the injections should be carried out.

(2) *Good Food.*

Leprosy being a chronic disease, it is all important to attend to the diet of the patients. They should have a well-balanced diet in which there are plenty of fresh vegetables and fruit; stale and partially decomposed food and highly spiced dainties must be avoided.

(3) *Constipation.*

This is placed in a separate category, because the importance of this ailment is not generally recognized in the treatment of leprosy. A constipated leper will not readily respond to treatment.

(4) *Plenty of Exercise.*

Leprosy, like its sister disease, tuberculosis, depends largely on the general treatment; not the least important part of this treatment is the insistence on graduated exercise. Lepers, especially those in the early stages, are not ill men, therefore they can be gradually trained until they can take comparatively violent exercise, e.g., walking until they reach a maximum of ten or fifteen miles a day. For young adults such games as football and cricket can be indulged in.

(5) *Fresh Air.*

This plays just as important a part in the treatment of leprosy as it does in the treatment of tuberculosis.

After these five things have been taken into account then it is time to think of "specific treatment." Within the last decade the number of remedies used for leprosy has been legion. I shall confine my attention to hydnocarpus oil mixed with creosote (double distilled) to the extent of four per cent of creosote. Another mixture which is more expensive, and can be used with as good effects, is the E.C.O. mixture of the School of Tropical Medicine at Calcutta. This is a mixture of the ethyl ester of hydnocarpus oil, 50 parts; olive oil, 50 parts, and creosote (double distilled) 4 parts. This latter mixture tends to cause greater reactions, and in those cases which have not reached the top of the curve it should be used with care. As the technique is exactly the same in both cases I shall describe that used for the oil. The best method, in my opinion, is that used and advocated by the Calcutta School of Tropical Medicine—the method of subcutaneous infiltration. The technique is as follows: use a ten-cubic-centimetre syringe, with a needle of suitable size; divide the body into eight parts, viz.:—

(1) The extensor aspect of the left arm.
(2) The extensor aspect of the right arm.
(3) The extensor aspect of the left forearm.
(4) The extensor aspect of the right forearm.
(5) The left buttock.
(6) The right buttock.
(7) The extensor aspect of the left thigh.
(8) The extensor aspect of the right thigh.

Never inject the inside of a limb or near a bony surface.

Having selected one of the above points, introduce the needle with a sharp push into the layer between the superficial fascia and the deep fascia (the needle should be freely moveable under the skin), and inject half a cubic centimetre, then withdraw the needle partially until the point is free from fascial entanglements, as the point is becoming free strands of fascia are sometimes felt slipping over the point of the needle, then introduce the needle in another direction and inject another half cubic centimetre, continue this round the arc of a circle, the original needle puncture being the centre. In this way one should be able to inject five to eight cubic centimetres by puncturing the skin once only. Injections are given twice a week, commencing with one cubic centimetre (in bad skin cases with half cubic centimetre) and going up to twelve cubic centimetres, increasing by half cubic centimetre each time. During the treatment a watch should be kept on any reactions which may occur. While one cannot lay down hard and fast rules as to the stoppage of the injections during a reaction, yet the following may serve as a guiding principle: If the temperature persists for more than twenty-four hours after the injection do not increase the dose; if it keeps up for more than forty-eight hours, halve the dose; if it keeps up for more than seventy-two hours stop the injections. As experience is gained one will often find that one can carry on small injections in spite of a small rise in temperature. Withhold injections if there are signs of reaction in the eyes until that reaction has completely subsided.

Treatment of Depigmented Patches, Skin Rashes, and Nodules.

All patches should be painted with trichloracetic acid, diluted 1 in 5 for the face, and 1 in 3 for the body. Only paint a few patches at a time, and do not paint the same set of patches more than once in ten days. The acid is a strong irritant and may cause ulceration if used injudiciously. For nodules, 1 in 1 acid may be used, but paint only one or two at a time.

Prognosis.

Having dealt briefly with the treatment, let us now turn to the question of prognosis. Few lepers actually die of leprosy, and if they are not carried off by some intercurrent ailment, such as tuberculosis, nephritis, or some acute illness, the disease ultimately arrests itself. But, as explained, leprosy arrests itself at the expense of the body. A patient is not only desirous ot knowing what the chances of getting rid of his disease are, but he is also anxious to have some idea of the likelihood or not of gross deformities setting in. To anwser this question one or two general principles may be laid down. Firstly, in the majority of the very early nerve lepers, that is those who have just begun to show signs of the disease in the form of a few depigmented patches or a slight loss of superficial sensation, the disease should become arrested, and at this stage if the disease is

checked there should be no resulting deformity. The loss of deep pressure sense is of serious import as the recovery of this is not hopeful.

The prognosis as to skin leprosy should be guarded. While saying this, the statement can be made that the response to treatment is better in the pure skin cases than in either the mixed or late nerve cases. The outlook for the early skin leper is very much more hopeful than it was six years ago because of the advance in knowledge and treatment. Naturally, the longer the patient has had leprosy the greater is the likelihood that gross deformities will set in. In the treatment of this disease one cannot lay down hard and fast rules, each case must be taken on its own merits. The treatment of leprosy taxes the patience of both the physician and the patient, but it can be said that a day of hope has dawned for the early leper, and that the physician can take up the treatment of this disease to-day without the old feeling of utter hopelessness. When a patient has apparently lost all active signs of the disease he should be kept under close observation and treatment for at least six months, and when he is released on parole he should be examined every three months for three years, and every six months for two years after that, and then told that he must keep himself as healthy as possible and report should any suspicious signs reappear. While the position to-day is very much more promising, yet one must ever keep in mind the fact that leprosy is one of the most deceptive diseases with which the practitioner in the tropics is called to deal, and therefore he should not make the mistake of being over optimistic, but on the other hand, if there are no grounds for it he should not be pessimistic, because the keeping up of the *moral* of the patient is an important factor in treatment.

While it may be many decades, if not centuries, before leprosy is stamped out in any country in the East in which it has been endemic for a long time, one can look forward to the day when leprosy will be as uncommon there as it is in Europe now.

REFERENCES.

[1] Muir. "Leprosy Diagnosis, Treatment and Prevention," p. 6.
[2] *Idem. Ibid.*, p. 2.
[3] Rodriguez. "Disturbances of Cutaneous Sensibility in Leprosy," *The Philippine Journal of Science*, vol. xxvii, August, 1925, pp. 455-480.
[4] Hansen and Looft. "Leprosy in its Clinical and Pathological Aspects," translated by Norman Walker, p. 67.

ARSENIC AND ANTIMONY IN MALARIA.

By Major D. T. M. LARGE

AND

Captain V. J. BONAVIA.

Royal Army Medical Corps.

Acting on the analogy of the value of arsenical preparations in syphilis and of antimony in kala-azar, etc., an inquiry was instituted to attempt to define the value of these drugs as curative agents in malaria. The main results of three months' work are here described.

A series of forty odd cases was picked out during the malaria season, and complete records made of their condition from the moment they came under observation until the present date. Only the severest cases were chosen, the basis for the choice being either a history of several relapses or the presence of enlarged spleen or of anæmia.

Two other factors were taken into consideration during the inquiry. It is a well-known fact that officers in India who contract malaria do not, as a rule, relapse nearly as frequently as the men, and as it was thought possible that diet during convalescence and afterwards might play a part in this, all the patients concerned were given as varied and as full a diet as could be arranged.

It was also considered that the small amount of vitamins ordinarily contained in the average day's food of the soldier in India possibly lowers his resistance to the malaria parasite and leads to relapse, and so an excess of vitamins was added to the daily diet.

Breakfast for each man consisted of porridge with cream, tea and fresh eggs, followed by a teaspoonful of cod-liver oil. Dinner consisted of fresh meat or chicken, fresh green vegetables, half a pound of fresh fruit, a milk pudding and cheese, bread and butter. At tea time each received extra butter, jam, or two eggs. Supper consisted of milk or cocoa made with milk, bread and butter, and a bottle of stout.

The gain in weight on this diet was, of course, marked, an increase of half a pound a day being about the average. Every case was weighed regularly once a week from the date his temperature fell to normal. When the existence of the special malaria ward became generally known, there was quite a competition amongst malaria cases to get into it.

Each patient was kept in bed for seven days after the fever abated, and when allowed up was taken for an hour's walk every day around the cantonments.

The arsenical compounds chosen for the inquiry were: (1) Stovarsol in doses of eight grains daily for ten or fourteen days. (2) Soamin, a course of three grains daily for ten days being considered sufficient at first. In later cases the course was made to last twenty days, three grains being given daily. (3) Kharsulphan, given by intramuscular injection every second or third day in increasing doses, commencing with 0·15 gramme.

The only antimony compound tried was stibosan or Von Heyden 471, which has lately been used so much in kala-azar. Intravenous injections of 0·3 gramme every second or third day were used—a course of ten injections being considered necessary, as this is the course advocated in kala-azar.

A certain number of control cases were included in the inquiry. These were treated in the routine manner with quinine, and similar examinations of their blood were carried out, so that their results can be compared with those of cases treated by the special drugs.

It will be noted that the results were unsuccessful. Patients improved rapidly in health and in weight, as a result probably of the special diet, but this did not prevent their relapsing. None of the drugs used proved superior to quinine.

Many of the cases relapsed again and again, and in several instances the same man was tried on several different drugs. It should be emphasized that most of the patients were very severe malaria cases, and very prone to relapse, so that the drugs received a very severe test.

It will also be noted from the results of each case that his fitness, as gauged by appearance, spleen and blood-state, had little relation to the question of relapse. An attempt to put each man into various categories of fitness was made, according to his general health, blood and spleen condition. Those marked category A are the fittest men, B are less fit, and F are least fit. It would have been better perhaps to have "categorized" the men according to the number and frequency of recent relapses, but this was not done at the time. In any case one would have had only the patient's word to go upon, for it was found that the medical history sheets could not be relied upon for evidence of previous malaria, as they only recorded admissions to hospital. Inquiry into the malaria history of the man undergoing this special treatment showed that almost invariably a man had several attacks of fever before going sick.

I believe that very few really "fresh" cases of malaria are treated in hospital and that most of them have had several attacks in barracks previously, for which they may or may not have obtained a dose of quinine from the medical orderly. It is possible that routine quinine given to a true "fresh" case will be curative in nearly every case. Perhaps this is the explanation of the fact that the officer gets one attack of malaria and no more as a rule. He is better informed and takes quinine regularly at least for a few days.

(1) Stovarsol Cases.

Stovarsol is said to contain 27 per cent of arsenic. It has been used in a large number of benign tertian cases of malaria by Marchoux, who states that in benign tertian cases it produces a rapid disappearance of parasites from the blood, but that in malignant tertian cases it is not so valuable.

(*a*) It was tried first on three cases, given by mouth in doses of eight grains daily for ten days, as in cases of dysentery. In one case it had no effect on the fever or on the parasites, and had to be discontinued after the patient had a relapse on three occasions. In another, relapse took place one day after the ten days' course was completed. The third case has not relapsed.

(*b*) Another series of cases was taken, and after the temperature had been brought to normal by quinine, and had definitely settled, a similar course was commenced, reinforced by quinine in ten-grain doses daily to keep the parasites in check while the stovarsol was being given. Five cases were included; of these three have relapsed, two being benign tertian cases and the other malignant tertian.

(*c*) A third series consisted of five cases treated similarly to those in series (*b*), but the course of stovarsol and quinine was continued for fourteen days. It had been noted early in the inquiry that patients to whom little or no quinine was given tended to have their relapse about the fourteenth or fifteenth day of normal temperature, and in this series the course was lengthened to cover this period. Two of these cases have relapsed (see table).

Notes.—It is impossible from the three cases treated on stovarsol alone, two of which were successful, to draw any conclusions as to its effect on the spleen or on the blood. In the successful case, however, the blood was not markedly improved. The red blood-corpuscles before treatment were 3,900,000 and the hæmoglobin seventy-five per cent. A month after treatment was commenced red blood-corpuscles were 3,190,000 and hæmoglobin seventy-five per cent. During this period, however, the spleen had become normal in size.

In the unsuccessful cases the spleen was not reduced in size, nor was improvement in the blood-state noted.

(2) Soamin Cases.

Soamin is an arsenical compound, containing about twenty-two per cent of arsenic. The dose recommended by the makers is one grain three times a day, and it is stated in the pamphlet describing the drug that this is a maximum dose, which should not be continued after sixty grains have been taken.

(*a*) Four cases were given a course of thirty grains of soamin, after the temperature had been kept at normal by quinine for a day or two, when the quinine was stopped. Of these three relapsed within one day of stopping the drug.

(*b*) One case was given a similar course, but in addition an attempt was made to keep the parasites in check by giving quinine every week in doses of five grains three times a day for two consecutive days. This case relapsed one day after conclusion of the course.

(*c*) One case was given a course as in (*b*), and when thirty grains had been given, blood examination showed very numerous crescents. The course of soamin and quinine was continued until sixty grains had been taken. Crescents disappeared from the blood, and so far no relapse has occurred.

(*d*) Five cases were given an extended course of soamin, the amount of the drug received being 42 grains in one case, 54 grains in another, and 60 grains in three cases. In addition quinine was given daily in ten-grain doses for ten days. One of these cases has relapsed (see table).

Notes.—In the case of soamin, the dosage was experimental, but it is obvious that thirty grains is insufficient. It is regretted that an extended course of sixty grains was not given to a series of cases with and without quinine, but at the time soamin was not considered to have a parasite-killing effect. It is proposed to commence a series of cases on these lines in the near future. Only one of the cases which received 60 grains of soamin has relapsed, although the amount of quinine given would, by itself, be insufficient to prevent relapse. Only one of the five cases on soamin alone had a markedly enlarged spleen, and this became normal under treatment. Two of the cases showed improvement in the blood-state; the other two had a practically normal blood-count before treatment.

(3) Kharsulphan.

This is an arsenical compound of the same nature as kharsivan which is given in syphilis, the difference being that it is prepared for intramuscular injection. Injections of 0·15 gramme are given every second or third day, increasing gradually to 0·6 gramme as the course goes on. All injections caused a considerable amount of pain.

(*a*) Three cases were treated as above. Two relapsed during treatment, in each case after five injections. The third has not yet relapsed. Each of these cases received previous to the kharsulphan course at least ninety grains of quinine to bring the temperature to normal.

(*b*) One case was treated as above and in addition was given quinine weekly in doses of five grains three times a day on two consecutive days. He relapsed during treatment. Of the three cases treated with kharsulphan alone, only one had a markedly enlarged spleen. As this was an unsuccessful case, the spleen was not reduced in size. The case which did not relapse on this treatment showed distinct improvement in the blood-count (see table).

Notes.—Kharsulphan is not considered to have any real effect in malaria. It is very expensive, each dose costing about three rupees.

Stovarsol, Eight Grains Daily. Course of Ten Days. Fullest Diet. Vitamines in Excess. (*Series A.*)

No.	Name	Commencement of attack	Duration of fever, days	Type of parasite	Days on quinine, 30 gr.	Spleen	Appearance	Category	Previous attacks	R. B. C.	Hb.	Amount of drug received	Progress	Days, normal temperature after conclusion of treatment	Gain of weight in hospital	Remarks
1	D.	14.9.25	4	*B.T.*	*Nil*	P_3 Edge hard	Anæmic	C	1	3,900,000	65	80 gr.	—	—	11 lb.	—
4	A.	14.9.25	9	*B.T.*	*Nil*	Not enlarged	Healthy	A	8	4,900,000	65	32 gr.	Did not control fever therefore discontinued		—	—
6	G.	30.9.25	3½	*B.T.* *M.T.*	4½	P_3	Sallow	E	1	4,950,000	65	80 gr.	Relapsed	1	11½ lb.	—

Stovarsol, Eight Grains Daily Plus Quinine Ten Grains Daily. Course of Ten Days. Fullest Diet. Vitamines in Excess. (*Series B.*)

8	C.	26.9.25	2	*B.T.*	2½	Not enlarged	Sallow	B	2	3,530,000	72	80 gr.	Relapsed	41	8½ lb.	—
9	W.	25.9.25	2	*B.T.*	1	Not enlarged	Slight pallor	B	2	3,910,000	68	80 gr.	Relapsed	132	9 lb.	—
10	H.	26.9.28	3	*B.T.*	3½	P_4 Rounded edge	Sallow	D	4	4,150,000	71	80 gr.	—	—	9¼ lb.	—
11	C.	28.9.25	3	*B.T.*	3	P_3 Edge sharp	Sallow	E	2	3,760,000	65	80 gr.	—	—	10½ lb.	—
7	C.	7.10.25	3	*M.T.*	1	P	Ruddy	A	3	5,120,000	72	80 gr.	Relapsed	15	6 lb.	—

Stovarsol, Eight Grains Daily for Fourteen Days. Quinine Daily during Course. (*Series C.*)

42	H.	8.11.25	4	*M.T.* *B.T.*	3	P_2	Very pale and sallow	D	5	3,800,000	75	112 gr.	—	—	6¾ lb.	Quinine 30 gr. for 3 days Quinine 10 gr. for 11 days
43	G.	7.11.25	2	*M.T.*	3½	P_2	Pallid	B	7	3,600,000	62	112 gr.	Relapsed	105	6¼ lb.	Quinine 30 gr. for 3½ days Quinine 10 gr. for 12 days
44	W.	8.11.25	3	*M.T.* *B.T.*	5	P	Pallid	B	7	4,700,000	70	112 gr.	Relapsed	7	5 lb.	Quinine 30 gr. for 5 days Quinine 10 gr. for 9 days
46	C.	9.11.25	2	*M.T.*	2	P_1	Very pallid	B	3	3,850,000	70	112 gr.	—	—	1 lb.	Quinine 30 gr. for 2 days Quinine 10 gr. for 12 days
50	H.	16.11.25	1	*B.T.*	3	P_3	Not anæmic	C	12	5,680,000	75	112 gr.	—	—	4 lb.	—

Soamin, Three Grains Daily for Ten Days. (*Series A.*)

13	P.	2.10.25	3	*B.T.*	4	P	Pallid	B	3	4,210,000	75	30 gr.	Relapsed	10	8 lb.	Had 22 days normal temperature between attack and relapse
17	G.	11.10.25	1	*M.T.*	2⅓	Not enlarged	Pale	B	6	3,640,000	60	30 gr.	Relapsed	3	8¼ lb.	Had 15 days normal temperature between attack and relapse
24	E.	13.10.25	1	*B.T.*	2	P_3 Edge hard	Slight pallor	C	9	4,490,000	78	30 gr.	Relapsed	4	7 lb.	Had 15 days normal temperature between attack and relapse
12	B.	28.9.25	4	*M.T.*	6	Not enlarged	Pale and sallow	C	2	3,400,000	65	30 gr.	—	—	—	After soamin course— R B.C.=5,800,000 Hb.=80 percent

No.	Name	Commencement of attack	Duration of fever, days	Type of parasite	Days on quinine, 30 gr.	Spleen	Appearance	Category	Previous attacks	R. B. C.	Hb.	Amount of drug received	Progress	Days, normal temperature after conclusion of treatment	Gain of weight in hospital	Remarks
Soamin, Three Grains Daily. Quinine, Weekly, Fifteen Grains on Two Consecutive Days. *(Series B and C.)*																
36	H.	25.10.25	4	*B.T.* *M.T.*	3	P_4	Anæmic	C	4	4,660,000	75	30 gr.	Relapse	1	3 lb.	10 days' course of soamin
31	C.	17.10.25	1	*M.T.*	4	P_2	Pallid	B	2	3,640,000	70	60 gr.	—	—	13 lb.	20 days' course of soamin
Soamin, Three Grains Daily. Quinine, Daily. *(Series D.)*																
21	G.	29.10.25	3	*M.T.* *B.T.*	3	P_3	Pallid	C	7	4,220,000	70	60 gr.	—	—	7 lb.	—
33	E.	29.10.25	1	*B.T.*	3	P_2	Slight pallor	C	10	5,140,000	80	54 gr.	—	—	1 st. 2 lb.	—
48	C.	11.11.25	3	*B.T.*	4	Not enlarged	Pallid	B	3	3,190,000	78	60 gr.	Relapsed	35	1½ lb.	—
49	D.	9.11.25	1	*B.T.*	7	P_9	Extremely pale	F	2	2,710,000	55	60 gr.	—	—	5½ lb.	—
44	G.	18.11.25	1	*M.T.*	4	P_4	Anæmic	F	5	2,980,000	65	60 gr.	—	—	6 lb.	Marked improvement
Kharsulphan. Fullest Diet—Vitamins in Excess. Intramuscular Injection every Third Day. *(Series A.)*																
18	H.	11.10.25	1	*M.T.*	3	P_4. Soft and tender	Sallow	C	3	4,690,000	75	0·9 grm.	Relapsed during treatment		1 lb.	—
19	W.	12.10.25	2	*B.T.*	3½	P. Soft	Pale	B	4	4,290,000	65	0·9 grm.	Relapsed during treatment		14 lb.	—
22	G.	10.10.25	3	*B.T.*	3½	P	Normal	B	4	3,460,000	65	3·72 grm.	—	—	26 lb.	—

Plus Weekly Quinine, Five Grains, Three Times Daily Two Consecutive Days. (*Series B.*)

19 35	W.	27.10.25	3	*B.T.*	4	P	Pale	B	5	3,510,000	75	2·25 grm.	Relapsed treat	during ment	$8\frac{3}{4}$ lb.	—

Von Heyden 471.—Course of Ten Injections—2·9 grammes. Fullest Diet. Vitamins. (*Series 4.*)

15	B.	9.10.25	2	*B.T.*	3	P_3	Not anæmic	C	4	4,730,000	75	2·9 grm.	—	—	1 st. 1 lb.	R.B.C. after one month = 4,390.000 Hb. after one month = 80 per cent
23	T.	12.10.25	4	*B.T.*	$4\frac{1}{2}$	P_4	Pallid	C	1	3,500,000	70	2·9 grm.	Relapse	73	1 st. 3 lb.	—
25	B.	13.10.25	2	*M.T.* *B.T.*	2	P_3	Pallid	D	3	3,060,000	60	1·4 grm.	Relapse during course	*Nil*	*Nil*	Had 5 injections. Relapsed after 14 days. Normal temperature
38	P.	2.11.25	2	*B.T.*	3	Not enlarged	Not anæmic	A	5	4,360,000	78	2·3 grm.	Relapse during course	*Nil*	*Nil*	Had 7 injections, i.v. R. B. C. = 4,400,000. Relapsed after 15 days. Normal temperature. Hb. = 75 per cent

Routine Treatment Quinine plus Fullest Diet.—Vitamins in Excess. (*Series 5.*)

14	N.	7.10.25	3	*M.T.*	10	P	Sallow	C	1	3,340,000	75	300 gr.	--	—	$5\frac{1}{2}$ lb.	—
16	A.	10.10.25	4	*M.T.*	7	P	Not anæmic	A	1	3,540,000	75	210 gr.	Relapse	*Nil*	$4\frac{1}{2}$ lb.	--
29	A.	21.10.25	2	*B.T.*	7	*Nil*	Not anæmic	A	9	4,620,000	75	210 gr.	—	—	$3\frac{1}{2}$ lb.	--

Routine Treatment—as Normally Carried Out.

20	B.	10.10.25	2	*B.T.*	7	P_3	Pallid	E	2	3,260,000	70	210 gr.	—	—	$4\frac{1}{2}$ lb.	—
41	M.	4.11.25	3	*B.T.*	10	P_2	Ruddy	B	15-20	4,050,000	78	300 gr.	Relapse	21	—	—
28A	H.	17.10.25	4	*B.T.*	10	P_2	Pallid	C	4	4,040,000	75	300 gr.	Relapse	16	$6\frac{1}{2}$ lb.	--

(4) Von Heyden Cases.

Von Heyden 471 is a compound of antimony, and it has been used considerably of late in the treatment of kala-azar, for which disease a course of ten injections of 0·3 gramme is considered sufficient to cure almost any case.

(*a*) Four cases were treated as above, the course being commenced a day or two after the temperature had been kept normal by quinine. Two of them relapsed during treatment, and one later (see table).

(*b*) Two cases were treated with Von Heyden as above, with the addition of quinine weekly in doses of fifteen grains daily on two consecutive days. One relapsed during treatment after more than half the course had been given.

Notes.—Von Heyden does not cure malaria.

Of four cases treated by this drug alone, three had enlarged spleen, and in two of these the spleen rapidly became normal. The third case did not improve. He relapsed subsequently.

No improvement in the blood-state was noted in any of these cases treated by this drug alone.

(5) Routine Cases.

(*a*) Three cases were given routine quinine treatment, but received the ordinary hospital diet, that is they were treated as malaria is treated in all military stations.

Two relapsed.

(*b*) Four cases were given routine quinine treatment, reinforced by the fullest diet containing an excess of vitamins. One relapsed (see table).

Editorial.

IMMUNIZATION AGAINST MEASLES.

In the years 1923-1924 735 cases of measles occurred amongst British troops stationed at home and abroad, and of this number women and children contributed almost exactly half. During the late war there was probably no disease which caused so much dislocation of the movements of troops as measles. Young soldiers and recruits from sparsely populated districts or from places where the disease was uncommon, notably the Highlands and Islands of Scotland and New Zealand, where the local inhabitants had previously acquired no immunity, were especially susceptible; they suffered from severe and even fatal forms of the disease. There was a high rate of incidence during training and in the field which, at times, seriously reduced the military efficiency of their units.

The incidence of this troublesome disease in the Army and its military importance in time of war are perhaps sufficient justification for us to review briefly the recent work that has been done, mainly abroad, for its prevention. There can be no doubt that the methods of prophylaxis used in America, Germany, and elsewhere should be more extensively tried in this country, and in the Army, where data giving the results of prophylactic treatment applied under various conditions of climate could be collected.

Apparently, the most successful and practical method that has so far been devised for the protection of persons susceptible to measles is the injection of the blood-serum of cases convalescent from the disease. Nicolle and Conseil first tried this method in 1916, and since 1919 it has been used in many continental cities, and in North and South America.

Rudolph Degkwitz, of Munich, apparently has proved that by inoculation of a small quantity of serum derived from a person convalescent from measles all the contacts can be protected completely. He recommends that the serum be taken from the convalescent on the seventh day after the cessation of fever, when the blood contains the maximum quantity of antibodies; forty cubic centimetres of blood should be withdrawn; this will yield about seventeen cubic centimetres of serum, to which is added a few drops of five per cent solution of carbolic acid, and the serum is then preserved in ampoules. He has worked out the doses needed to confer immunity, and advises that on entering a house where there is a case of measles the doctor should immunize the contacts with convalescent serum. In dealing with children, it is stated that if the rash has only just appeared, then a dose of three cubic centimetres of a convalescent patient's serum will

give complete protection to the other children in the house; but if the disease has been developed for twenty-four to forty-eight hours, some five or six cubic centimetres will be required. In cases where the time since exposure to infection is over three days, however, larger doses will be required, and protection will be less certain.

When the serum is injected shortly after exposure to infection, only a passive immunity is conferred, and this passes off in a few weeks; but where the injection is not administered until six or seven days or so after exposure, a modified and very mild attack of measles results, which is said to give lasting protection. It follows, therefore, that if the exact date of infection is known it would be better to delay the injection for a few days so that the patient may get the disease in an attenuated form and be permanently protected.

In no case, it is stated, have any untoward effects of inoculation been noted; the use of human serum has the advantage of not causing serum sickness or super-sensitization, and, within the limits specified, the results have been uniformly good. When the serum of convalescents is not obtainable the serum, or whole blood, of an adult who has suffered from measles in childhood may be used instead, but in this case a dose of twelve cubic centimetres of serum, or even thirty cubic centimetres of the whole blood, would be needed for a child aged 3—a rather large dose for one so young, and only recommended where no stock serum is available. In all cases the usual precautions should be taken to exclude the presence of syphilis, tuberculosis, malaria, etc., in the donor.

In the *Medical Officer* for April 10, 1926, Doctors Ludwig Hektoen and Lovett, of Chicago, give an account of trials of this kind of serum therapy. They quote Von Torday, who summarized the cases up to 1923 and found that among 2,000 children prophylactically treated by means of measles-convalescent serum, only three per cent were not protected. In the Durand Hospital, Chicago, 57 susceptible children were exposed to infection—9 of these were not treated and they all developed measles; and of 48 who were given the serum, only 4 fell sick with the disease. In this hospital the convalescent serum was prepared by taking six to ten ounces of blood from the vein of an adult or elder child when the temperature had been normal for four days following measles and, after Wassermann and culture tests had been made to ensure sterility. Serum from several persons was pooled; 0·25 per cent of tricresol was added for preservation and the serum sealed up in vials containing five cubic centimetres. The vials were kept on ice, and it was found the immune substance remained potent for at least six months. To ensure complete protection, five to ten cubic centimetres should be given within five days after exposure. The immunity conferred is, of course, temporary, lasting probably only a few months, after which the child again becomes susceptible. If the injection is not given until the sixth to the ninth day after exposure to infection, a mild attack of measles is likely to ensue and a permanent immunity is then acquired. The production of

these mild atypical attacks is, however, somewhat uncertain. Serum given more than ten days after exposure probably has no effect.

A table of dosage for modified or full protection given by Zingher (*Journal of American Medical Association*, 1924, 82), is as follows :—

	Days after exposure		
For complete protection	1—4	5—6	7—8
Convalescent serum	2·5—3 c.c.	5 c.c.	7—5 c.c.
Recently recovered serum ..	5 —6 ,,	7·5 ,,	10 ,,
Immune adults' serum	10 ,,	15 ,,	20 ,,
For modified attacks	1—5		5—10
Convalescent serum	1·5 c.c.	..	2·5 c.c.
Recently recovered serum ..	2·5 ,,	..	5 ,,
Immune adults' serum	5 ,,	..	10 ,,

These amounts are for serum ; if whole blood is to be used the amounts inoculated should be twice as great, but the immunizing power of whole blood is said to be less certain, although it has the advantage of being rapidly obtained when prepared serum is not available.

The successful elimination of the disease on a large scale by the use of human blood may be prejudiced by a shortage of convalescents from whom it can be obtained, although the serum from 300 donors is said to be sufficient to immunize 2,000 to 3,000 children.

The results of a recent trial of prophylactic measures during an epidemic of measles in a large boarding school in America have been recorded, and they do not appear to be quite so convincing.

It was found that a dose of twenty cubic centimetres of blood from an adult who suffered from measles twenty years previously had no appreciable effect in either preventing or modifying the disease. Blood from convalescents in doses of nine cubic centimetres of the whole blood (five cubic centimetres of serum), given before the end of the first week of the incubation period, had little or no effect in preventing the disease, but in many of the inoculated boys the disease was remarkable for its mildness and for the complete absence of complications, whereas among the uninoculated group of boys broncho-pneumonia, otitis and other sequelæ occurred.

Muñyeno uses convalescent serum in doses of one cubic centimetre for each year of life, or half a cubic centimetre for each six months ; in the event of difficulty in obtaining convalescent serum, he advocates the intramuscular injection of three cubic centimetres for each year of the child's life of the citrated whole blood of a member of the family of the child exposed to measles, provided that the clinical and biological examination of the donor is satisfactory, and that he or she has previously suffered from measles. If it is desired to prevent entirely the onset of measles, the injection should be given before the sixth day of the incubation period ; but if an attenuated form with subsequent permanent immunization against the disease is aimed at, the injections should be given later.

It may be possible, however, to produce an immune serum in animals

which could be used for protection instead of human serum, and with this object in view Dr. Ruth Tunnicliff, of Chicago; Ferry and Fisher, of Detroit; and Caronia, in Italy, have isolated from cases of measles microbes which can produce an antitoxic serum when inoculated into animals. Caronia's microbe can also be used as a prophylactic vaccine.

Our summary will not be complete without mention of recent work on this aspect of the problem.

Since the investigations of George and Gladys Dick showed that scarlet fever is a disease similar to diphtheria, in that the *Streptococcus scarlatinæ* elaborates a toxin which is the pathogenic agent, medical investigators have predicted that the causative agents of similar diseases would soon be revealed. There appears to be some hope that this prediction, as regards measles at least, may be realized. Doctors Ferry and Fisher, of Detroit, in a preliminary report published in the *Journal of the American Medical Association* for March, 1926, claim to have isolated from the blood of patients suffering from measles a streptococcus which differs from the diplococcus previously isolated from the blood of measles patients by Tunnicliff, in that it is an aerobe that grows luxuriantly in the presence of oxygen and produces a soluble toxin specific to measles. With this toxin, prepared from broth filtrates of cultures of the *Streptococcus morbilli* —by which name the authors distinguish it—a skin test for measles has been elaborated which is applied by intracutaneous injection of 0·1 cubic centimetre of a 1 in 500 dilution of the toxin. Experiments with this toxin were made on persons susceptible and on those immune to measles, also on patients suffering with the disease, and it was found that persons who had suffered from measles previously did not react to intracutaneous injections of the toxin, whereas forty per cent of persons with no history of measles reacted positively to the toxin intracutaneously injected according to a technique similar to that adopted for the Schick and Dick tests. Patients in the pre-eruptive and early stages of the disease gave positive skin reactions to the toxin, while those in the later stage and convalescents gave negative reactions. When the toxin is mixed with measles-convalescent serum it is said to be neutralized and will not cause a positive reaction in susceptible persons; moreover, the serum from an animal immunized with the toxin, i.e., an artificially-prepared antitoxin likewise neutralizes the toxin when mixed with it; but the toxin is not neutralized when mixed with scarlet fever antitoxin or normal horse-serum.

Persons who gave positive reactions to intracutaneous injections of the toxin showed no reaction when the injection followed subcutaneous injections of measles-convalescent serum.

Since the serum of an animal immunized by the toxin was found to have the same immunizing or neutralizing properties as the serum of a person naturally immune, it would seem therefore that the toxin formed in the human body is identical with that produced by the streptococcus. More-

over, it is stated that a suspension of the streptococcus was agglutinated by the serum of measles-convalescent patients, but was not agglutinated by the serum of "controls" who had never suffered from measles.

In a more recent paper (Hoyne and Gasul, *Journal of the American Medical Association,* October 9, 1926), it is stated that the organism described by Ferry and Fisher, Caronia, and others, is probably the microbe discovered by Dr. Ruth Tunnicliff in 1917, and that apparent discrepancies in its bio-chemical and morphological characteristics are accounted for by variations in the cultural methods employed by different workers.

Tunnicliff has followed up her work on the supposed measles microbe by immunizing goats with it, and has obtained an immune serum by means of which passive immunization against measles can be acquired. This serum was tried by Hoyne and Gasul in the Cook County Hospital, Chicago, on 39 children who had been exposed to measles infection—with the result that 34 were completely protected from measles and 5 developed the disease in a mild form.

Degkwitz also, in view of the limitations to immunization by means of convalescent serum, adult serum, or whole blood, has extended his researches in the quest for a specific protective animal serum as a prophylactic against measles. He claims to have isolated an invisible, filtrable virus which is said to be present in the filtrate of nasal, pharyngeal and lachrymal secretions during the prodromal and exanthem stage of the disease and also in the blood shortly before and after the exanthem. The morphology and biology of this virus is at present obscure, and as the aim of the discoverer is said to be purely medical and practical, a morphological description is not attempted.

Apparently, however, it has been cultivated, and it is stated that sheep inoculated with cultures of the infectious material develop febrile reactions, and that the blood serum of sheep thus infected has prophylactic properties against measles when injected in doses of ten cubic centimetres between the seventh and tenth day of the incubation period in individuals who have been infected with this disease.

In so far as we have been able to follow the German literature relative to this remedy, there seems to be a difference of opinion as to the value of the Degkwitz sheep serum, and one writer states that in his opinion anti-measles serum obtained from animals is not adapted for prophylaxis and that its modifying properties cannot be admitted. In a disease like measles, which usually runs a mild course, a few failures are more significant than many successes.

Of the several claimants to an organismal cause of measles Ferry and Fisher have given us some noteworthy experimental evidence in support of their *Streptococcus morbilli,* but it cannot be said that the absolute specificity of any particular organisms associated with measles has yet been established. The production of active immunity against the disease is

still in the experimental stage, and it would be unwise to draw final conclusions from the relatively small number of experiments so far recorded.

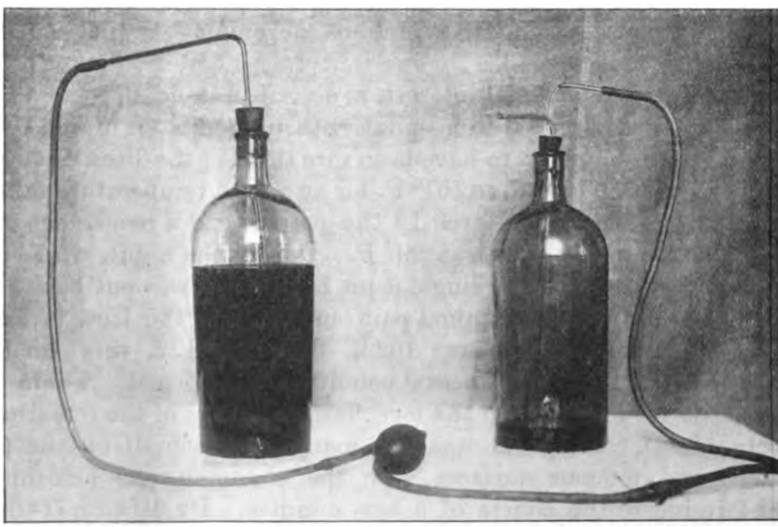
If, however, the claims of Degkwitz and others using convalescent or a specific animal serum are generally accepted, it is clear we may have the means of controlling measles and of modifying the severity of attacks, and of conferring a permanent or a temporary immunity against this disease. Moreover, if the work of Ferry and Fisher is confirmed, it seems obvious that the detection of susceptible persons by the skin test and their immunization by convalescent or other immune serum would be simple and effective, and that another serious menace to the life and health of children would be brought under control.

Clinical and Other Notes.

A SIMPLE WRIST EXERCISER.

By Major W. K. MORRISON, D.S.O.
Royal Army Medical Corps.

In all forms of remedial exercise, it is essential to hold the interest and attention of the patient. One of the most direct methods of doing so is to allow the patient to see work done for energy expended.



The apparatus shown in the accompanying illustration replaces the spring dumb-bell. It consists of two bottles, one of which contains coloured fluid. By means of an ordinary enema syringe the fluid is pumped from one bottle into the other. The corks are reversed and the process carried out again until the patient has completed two or three such pumpings.

The results have been satisfactory, and improvement from this line of exercise treatment appears to be quicker than heretofore in some of the common surgical conditions of the wrist.

NOTES ON A CASE OF MENINGOCOCCAL SEPTICÆMIA.

By Major H. T. FINDLAY and Captain R. N. PHEASE.
Royal Army Medical Corps.

The case to be described occurred in a series of four which were admitted to hospital during February and March, 1926, from the Woolwich Garrison. The chief point of interest lies in the fact that a meningococcal

septicæmia was proved to be present in two of the four cases—the meningococcus being isolated in pure culture from the blood.

Case 1, occurring in February, 1926, was a typical cerebro-spinal meningitis, which resulted in recovery.

After a short interval three cases occurred, all within eighteen days of one another. Two of these were septicæmic in type, clinically and bacteriologically. In each case the onset was sudden and severe, with well-marked purpuric rash on the limbs. Case 2 died before the development of obvious meningeal symptoms: the cerebro-spinal fluid was clear, under no pressure, and contained two cells per cubic millimetre when examined twelve hours before death. There was a complete absence of headache till very late in the disease. Cases 3 and 4 were similar in type but not so fulminating, obvious meningeal symptoms developing twenty-four hours after the onset.

Case 2, which is of especial interest, is described in detail :—

The patient was admitted to hospital with influenza on March 6, 1926. The chief complaint appears to have been sore throat; the disease ran a mild course with pyrexia of 100° F. to 101° F. for two days, temperature falling to normal two days later. On March 13 the patient had a recurrence of sore throat and his temperature rose to 99° F. During the night, while in the annexe, he collapsed and by falling cut his head. He was put back to bed and complained of severe abdominal pain and pains in the legs. At 6 a.m. on the 14th his temperature was 102·2° F., pulse 122, very small and thready, respirations 32. His mental condition was normal. There was a dusky purpuric rash present on the face, flexor surfaces of the forearms and legs (ecchymoses). The rash was less marked (petechial) on the trunk, hands, feet and mucous surfaces. On the abdomen one petechia was observed forming in the course of a few minutes. By 10 a.m. (14th) the patient was collapsed and pulseless, but mental condition remained good—facies normal but colour somewhat livid. Petechiæ and ecchymoses were spreading, particularly on the arms and legs. The tongue was dry and furred. The abdomen moved freely with respiration; there was some rigidity on the right side but no tenderness, liver dullness normal, spleen not palpable. Blood-count showed: white blood corpuscles 74,000, polymorphs 82 per cent., lymphocytes 8, large mononuclears 5, eosinophiles 1, basophiles 1, transitionals 3.

Examination of the Nervous Symptoms.—Vision and fields normal. No diplopia, left pupil dilated, does not react to light. Right pupil normal. Deep reflexes normal. Superficial reflexes normal. No loss of muscular power, no inco-ordination. 2 p.m. (14th) patient complained of pain in abdomen and legs; fresh ecchymoses were present on the legs, forearm and abdomen. Patient vomited twice. 6 p.m. patient was practically pulseless, but no anxiety in facies. Temperature subnormal and patient complained of headache for the first time. 10 p.m. temperature rose to 101° F. and patient died.

The above picture tallies closely with that of *purpura fulminans*, described in the older textbooks, and it is possible that some of these cases at any rate were really cerebro-spinal septicæmia. Blood-culture, however, cleared up the diagnosis after death. The meningococcus was type II strain, which was also present in the other three cases.

In order to trace the origin of the outbreak, extensive swabbing was undertaken both of patients and staff in hospital and of contacts in barracks. Several suspicious cultures were set aside as a preliminary measure. All except two were, however, finally eliminated by further tests. One of the carriers was a patient in hospital, the other was employed as room orderly in barracks. In both these cases meningococcal colonies were clearly predominant, a fact noted by Mathers and Harold in persistent as distinguished from temporary carriers (*Journal of Infectious Diseases*, 1918, xxii, p. 523). In a search for carriers from a large number of contacts this fact is worth remembering.

The case described recalls the discussion which has taken place as to the path of infection of the meningococcus from the nasopharynx to the central nervous system, and would appear to support the view that blood-infection, in some cases at least, is a precursor of infection of the nervous system. Horrock (*Arch. Inter. Med.*, 1918, xxi, p. 541) and Baestack (*Journal Am. Med. Assoc.*) assert that septicæmic infection occurs more often than is commonly supposed. The latter further states that septicæmia may even be present without any infection of the meninges. This was apparently so in the case described above.

All the cases encountered belonged to type II group, the prevalence of which in the London district during the first quarter of the year was pointed out by Gordon and his co-worker (Med. Res. Comm. Report, 1918) These four cases followed closely on an extensive epidemic of infective pharyngitis, which would predispose to the occurrence of infection by dissemination from chronic carriers and by production of a lowered vitality among individuals.

The technique employed for the isolation of the meningococcus and the detection of carriers was the usual one. In the choice of culture media it was found that ordinary blood-agar (pH 7·2) was quite satisfactory. With regard to the isolation of the organism from the cerebro-spinal fluid it was found advisable to be liberal with the inoculum as many of the meningococci noted in a direct smear are dead. Most satisfactory results were obtained when not less than half to one cubic centimetre of the cerebro-spinal fluid was used for inoculating plates.

———

RECURRENT INTUSSUSCEPTION.

By Temporary Captain W. B. SWETE-EVANS.
Royal Army Medical Corps.

Private C. T. P., aged 20, with two and a half years' service, was a patient in the Cambridge Hospital, Aldershot, from November 15, 1924, to December 18, 1924, with right inguinal hernia. Bassini's operation was performed, and the operator noted at the time "a large Meckel's diverticulum adherent to lower end of the sac." This was not removed. He was discharged on sick leave for a month. He states he suffered from constipation on leaving the Cambridge Hospital, and would often go for three days without an evacuation.

Two days before his leave expired he was admitted (January 15, 1925), to the Military Hospital, Colchester, with intussusception of the small intestine. Laparotomy was performed through the left rectus below the umbilicus and the intestine reduced. He was discharged on February 10, 1925. He went on three weeks' sick leave, and was three weeks back on duty when he reported sick at Ballykinlar camp, late in the afternoon of March 26, 1925. He then had no pyrexia, P. 75, but was sweating profusely. He complained of severe abdominal pain coming on in spasms. A large, soft tumour was seen and felt in the right iliac fossa with a smaller soft swelling just below the liver. There was slight rigidity of the right rectus—a healed scar was noted in the right groin, and a more recent scar to the left of mid-line below the umbilicus. Immediate laparotomy through the right edge of the rectus was performed, and about 10 inches of the small intestine was found invaginating the ascending colon and part of the transverse colon. This was reduced with great difficulty by manipulation. The bowel was purple in colour but had not lost its sheen, and the constipated contents of the intestine were gently pressed into the colon. A large Meckel's diverticulum was identified, but nothing further could be done as the patient was suffering from severe shock and was almost pulseless. The wound healed by primary union, and convalescence was complete by April 29, 1925, when a Medical Board recommended the man's discharge from the Army as unfit for further service.

A CASE OF SACCULAR ANEURYSM OF THE POSTERIOR TIBIAL ARTERY. COMPLETE EXPOSURE AND EXTIRPATION OF THE SAC.

By Major H. C. SIDGWICK, O.B.E.
Royal Army Medical Corps.

Staff-Serjeant D., R.A.S.C., was admitted to the Military Hospital, Colchester, complaining of a swelling on the back of his right leg.

The patient gave a history of having accidentally thrust the point of a sword into the calf of his right leg whilst taking part in some military

sports four years previous to admission. Shortly after the accident a swelling developed a little below the wound and gradually increased in size.

On admission to hospital he was found to have a swelling on the posterior surface of the right leg and towards the centre, in the line of the posterior tibial artery.

The swelling was of the size of a hen's egg, and pulsated. The pulsations were definitely expansile. An almost musical bruit was audible over it and the pulsations of the artery distal to it were diminished.

The patient complained of neuralgic pain in his leg, but no other signs of pressure were found. It seemed clear that a traumatic aneurysm of the posterior tibial artery was present, and the patient was most anxious to have it cured by operation if possible.

As it seemed probable that the classic incision for ligature of the posterior tibial would not provide sufficient exposure of the arterial trunk to enable the aneurysmal sac to be completely and safely extirpated, it was thought advisable to approach the vessel through the back of the leg with division of the calf muscles.

The patient was anæsthetized and placed on the table, lying on his abdomen with the foot extended and calf of the leg uppermost. An incision, twelve inches in length, was made in the line of the posterior tibial artery, starting two inches below the fold of the knee.

The skin was well retracted and the gastrocnemius divided longitudinally and the soleus exposed. This latter muscle was also divided longitudinally and the tendo Achillis split.

The aneurysmal sac was now exposed, but difficulty was experienced in clearly identifying the artery proximal to it.

The posterior, lateral, and medial surfaces of the sac were then cleared, but dense adhesions were met with anteriorly.

A tourniquet was therefore applied above the knee, the sac opened and the clot turned out.

The sac was dissected up anteriorly, the artery ligatured above and below it and the sac removed.

It was then discovered that the deepest fibres of the soleus and the aponeuritic layer in the upper part of the wound had not been fully divided in the early stages of the operation, which accounted for the difficulty in identifying the artery proximal to the sac.

After complete division of these structures the posterior tibial vessels and nerve were well exposed. The tourniquet was removed, and there was considerable oozing from the muscles, which was difficult to control completely.

The muscles and tendo Achillis were sutured, a glove drain left in the lower angle of the wound and the wound closed.

The dressings required changing twice during the first twenty-four hours following the operation and the drain was removed twenty-four hours later.

There was no loss of sensibility in the limb and the foot remained warm.

On the fourth day after the operation temperature and pulse were normal, but on the sixth day there was a slight rise of both temperature and pulse, and, on inspecting the wound, slight local sepsis was found in the lower part of it, which necessitated the removal of a few of the skin sutures. A small collection of pus was evacuated and the wound irrigated with eusol. Two days later the temperature and pulse fell to normal and remained so. The causative organism was *Staphylococcus albus*. The skin edges were drawn together with strapping, but there was sloughing on a small portion of the tendo Achillis.

Early movements of the ankle were carried out, but a little contraction of the tendo Achillis remained when the wound had healed.

The difficulties met with at the time of operation might have been avoided by following the directions given by Fiolle and Delmas in "Surgical Exposure of the Deep-seated Blood-vessels," and the following modifications of the operation described above to conform with their technic are suggested:—

First, the incisions, instead of being in the line of the artery, should commence above between the two heads of the gastrocnemius, and then be directed slightly inwards so as to include the projection formed by the inner belly of the muscle within its concavity and then brought down to the inner border of the tendo Achillis and followed to its insertion.

Secondly, in order to facilitate the exposure of the presolar space, the left index finger should be inserted through a button-hole insertion in the superficial aponeurosis and pushed up in front of the tendo Achillis and soleus, and used as a guide when dividing the muscles. This case is published by kind permission of Lieutenant-Colonel W. Croly, D.S.O., R.A.M.C., the Officer Commanding the Military Hospital, Colchester.

Travel.

A KASHMIR DIARY.

BY MAJOR D. T. M. LARGE.
Royal Army Medical Corps.

(*Continued from p.* 387.)

July 14, 1925.
Hiurbhagwan to Baltal.

Baltal is an extraordinarily pretty place. Our camp is pitched in a clump of pines, just on the edge of the Sind river where it makes a right angle bend on its way north-west towards Sonamarg. We were settled in to-day before three o'clock, for to-day's trek did not take very long, although I think it was by far the most difficult part of the way, if not actually hazardous.

Before starting this morning we found it very cold in our shut-in valley, so much so that breakfast had to be had right inside the tent. No sun reached us till after eight o'clock because the valley was so deep. There was a lot of snow about too, in fact much of our way down the valley to-day lay over snow bridges or snow beds filling up the bottom of the valley, and covering over the stream beneath. I say the road was hazardous, but that was only where the snow had melted, for then we had to scramble along the hill side, with no path at all, and only loose rocks and stones for a foothold. A slip in one of these places might have meant only a ducking, but much more often the result would have been a crash over a cliff, perhaps into the torrent below, perhaps straight into the mouth of a crevasse in the snow bed.

These Kashmiri coolies are wonderful men at their job. Imagine carrying a tent on your back over such places, bent nearly double with the weight of it. They are very surefooted, and while we, equipped with special climbing boots, have been gingerly picking our way along, they trudge on slowly and with never a slip. They do not wear boots, but sandals made of rope, which seem to afford a wonderful foothold on both rocks and snow. I watched them making them this evening after they arrived in camp. They cut the thin bark off young trees and make narrow strips, and these strips are twisted into a rope. Then with this rope they do a lot more twisting and weaving, and produce a sole about half an inch thick, with a few thongs on it which they tie over their insteps. These are called "chupplies," and they are more usually made of grass rope, which I am told lasts better. One awful place we crossed to-day would have terrified anybody not wearing chupplies. It certainly "put the wind up me." The snow bridge had broken away in the middle, leaving a ledge some six feet wide, overhanging the stream about fifty feet below. You have no idea of the enormous depth to which the snow can drift in these valleys. Fifty feet is nothing, and it is hard and frozen like ice. In this place there was only the ledge of ice to walk on, as it had broken away from the hillside also, leaving a wide chasm many feet in depth. It was like walking on the top of a wall, only with the top made of ice. Luckily a few stones that had fallen on it from the cliff above gave us some sort of a foothold.

After a couple of hours of this sort of trekking, we came down into warmer and more genial regions, where flowers and grass appeared again, and soon we found walking more easy. Birch trees appeared first and then pines.

When about a couple of hours short of Baltal, we came across wild strawberries in such large numbers that we decided to make a halt for food, picking strawberries while waiting for the kettle to boil. It was a nice spot for a rest, as we were just opposite the mouth of the valley coming down from Amarnath. There is a path leading up that nullah from where we sat, but at this season laden coolies cannot get along it as the snow bridges there have melted.

Baltal is quite civilized after our experiences of the last few days. There is actually a house, a rest house for travellers to Leh and Ladahk generally, and we found a camp near it with some people C—— knew in Srinagar. They were astonished to hear we had come down over the passes from Pahlgam to Baltal, instead of the more usual route, up the Sind Valley. In the rest house were two Indian travellers, gentlemen, with whom I talked for a time. They had been up to Ladahk to visit Leh, and were very enthusiastic over their trip, but they did not think much of Kashmir and its scenery. I do not think many Indians have an eye for natural beauty in scenery, certainly very few I have met. I remember on one occasion getting unreasonably angry with my motor boy, when I found him asleep as we were driving over the Banihal Pass into Kashmir, with one of the most wonderful views in the world spread out before us. Poor boy, the sight of an eight-anna piece in his hand would have been much more to his liking. Perhaps the better class Indian may appreciate scenery, but one does not meet them much in India.

From our camp can be seen a path cutting boldly across the opposite hillside. This is to be our road for to-morrow, and it leads towards the Zogi La Pass which connects Kashmir with Ladahk. It is strange to realize that this mere path is a busy and important trade route, linking up India with Ladahk and the mysterious countries of Central Asia.

July 15, 1925.

Baltal and over the Zogi La.

It was pouring this morning when we got up, which did not promise well for our day's trek, but by seven o'clock the clouds had disappeared, and it was obvious we were in for another fine day. By 8 a.m. everything was ready, food for the day packed into the basket, rucksack filled with field glasses and camera, and we started off, leaving the coolies with the camp to rest in Baltal for the day (fig. 4).

After about two miles of a stiff uphill path the way up to the Zogi La becomes easier, the valley opens out, and the road, instead of running along the edge of the khud, goes on to a snow bed at the foot of the valley for half a mile or so, then runs along beside the stream on green, grassy slopes. This is now the beginning of the pass, and one ascends gradually between barren rocky hills till the summit is reached, where for a mile or so the ground is so level that it is only by noticing which way the water is flowing that one can tell when the summit has been crossed. As a matter of fact, the source of the streams running down on each side of the pass is the same, a large snow bed on the hillside. Part of the water from this runs down into the Sind Valley, and through Kashmir, and part down the other side into Ladahk (fig. 5).

Ladahk by the way is quite different from Kashmir. It is a very barren and rocky country, whereas Kashmir is green and fertile. The people are

quite different in appearance, instead of the hook-nosed rather Jewish-looking Kashmiri, one finds short people with high cheek bones and snub noses, of a Mongolian appearance. We did not see many of them on the road to-day, and those only men. They wore long woollen coats, long woollen trousers falling into high and wide felt boots, and they were all very cheery when we spoke to them and asked them where they were going to or coming from.

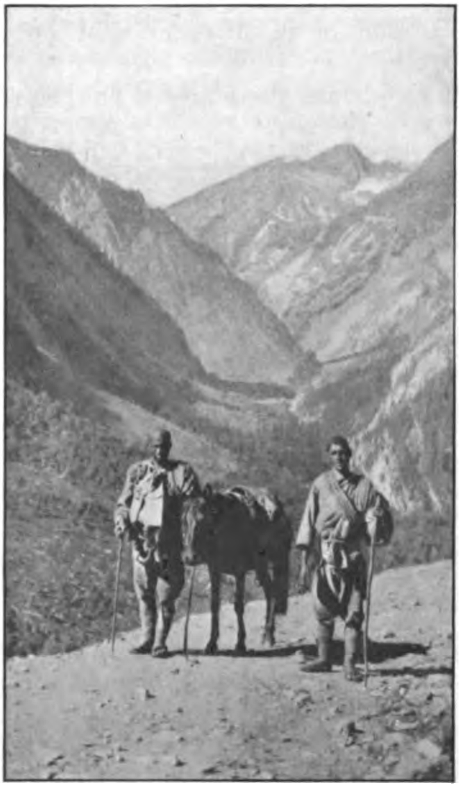


FIG. 4.—The Valley at Baltal.

After reaching the summit and not being able to see very far from it because the valley here makes a bend, it was obviously essential to go on, and "see what was round the corner," so we decided to go right on to Mitzoi, the first halting place on the way into Ladahk. The valley widens, and about a mile from the top of the pass there is a telegraph hut; I suppose a rest house for the men looking after the wire, which runs from Srinagar right up to Leh, the capital of Ladahk. Just about here, up a side valley, on our right, we saw a very high snow-covered peak with a glacier, and from the map it appeared to be the mountain behind Amarnath,

the Hindus' Mecca. Our map after this was no good to us at all, because it stopped short at this side valley—the Gumber Nullah, so that from now on we were literally "off the map." Still, it was very interesting tramping along beside the stream, now quite a considerable river flowing north into Ladahk. Everything was rock and hill. There were no trees or bushes whatever, but still plenty of flowers and plenty of grass close to the river.

After a steady walk of an hour and a half we saw the village of Mitzoi with its rest house. There isn't really a village at all, only the rest house with a few huts clustered round it. Curiously enough, these are the stables of a stud of polo ponies sent up from Srinagar for summer grazing.

Just beyond the rest house there was a fine view, and we sat for a

FIG. 5.—A Ladahki and his zo on the Zogi La.

while looking round us at the bleak mountains and the treeless valleys of Ladahk, and we could see many of the mountains and several of the valleys from where we sat. Presently we saw coming up the road from Ladahk a string of ponies and yaks, driven by a few Ladahkis. They were returning unladen from the interior somewhere, and were on their way to Srinagar for more loads of grain and rice, which have to be imported from Kashmir. I spoke to the men for a bit, a ragged, villainous looking lot, and asked them to let us ride their pack ponies back to the Zogi La. They were quite willing, especially when I promised them eight annas buckshish. I wanted to ride one of the yaks, but their saddles were not nearly so comfortable as those on the pack ponies. These yaks, by the way, are called zos, a zo being a cross between a true yak and a cow. The result is rather like a very sturdy small cow with a bushy tail like a horse.

So a string of yaks and ponies, with C. and me in the middle, and these ruffians of Ladahki drovers riding front and rear, made its way back towards Kashmir. They took us back as far as the Zogi La, and we were not sorry to stop for tea, as a pack pony with its saddle of wood and rope is not very comfortable for more than a few miles. The Ladahkis demanded matches and made a fire on their own—I suppose for tea also—as they are just as fond of tea as the Kashmiri.

A little down the road from the pass, towards Baltal, on suddenly rounding a corner, we saw the whole of the Sind Valley opened out before us. I have often read of this view in various books on Kashmir, but did not expect quite such a striking contrast, for while Ladahk is absolutely barren and treeless, you see from this corner a most beautiful valley, with pine-covered slopes, flowery meadows, and away down at the bottom the blue and silver of the Sind River as it rushes on its way westward to Srinagar.

July 16, 1925.

Baltal to Sonamarg.

The valley from Baltal to Sonamarg is described in "Neve's Guide" as affording a pleasant walk through rolling meadows and forests of birch, but neither of us appreciated the beauty of it very much, possibly because we were tired after our very strenuous day yesterday. The valley to my mind is barren-looking, and certainly on our side of it treeless, almost the whole of the last six miles into Sonamarg.

While sitting under a tree having lunch in Sonamarg village a telegraph peon came up and handed us a telegram for me. This speaks very well for the efficiency of the telegraph system out here, for we had never been in Sonamarg before, and had not been sitting there for more than five minutes.

In the village I was able to get cigarettes and some tea, and we found there that the camping ground was two miles farther on at Thajwas. That relieved us considerably, for we could not imagine anyone camping for more than a day in such a bleak spot as Sonamarg itself, and could not understand how people could come to it year after year for months at a time as they do. The camping ground is beside the Thajwas River, a branch of the Sind, down which we walked to-day. It is at the mouth of a valley called the Valley of Glaciers.

July 17.

Sonamarg to Koolan.

The view from our tent this morning in Sonamarg was about the finest we have had on the whole trek. Our tent was pitched so as to face up the Valley of Glaciers, and when I woke at six the sun had just reached the summit of the peaks which line the south side of the valley, picking out every crag or snowy peak against the clear blue sky. The rest of the valley was

deep in shade, and a line of pines stood out black against the sky on the northern side of the valley. I lay in bed and watched the sun coming down the mountain side, throwing long shadows from each peak across the snow slopes and glaciers between them. Gradually the shadows on the snows became shorter as the sun rose higher, and soon the whole valley became lit up as the sun came up over the hills.

By this time we were up and dressed and had our table moved out into the sun for breakfast, for the air was chilly inside the tent. Not that we often do have our meals inside the tent, for the scenery everywhere is much too beautiful for us to waste any more time than is necessary inside. We often, however, sit at the front door of the tent for meals, so that one of us can use a bed as a chair and the other sit on the single chair we have brought with us.

FIG. 6.—Logs collecting on rocks in the stream.

A steep path led us down some hundred feet to the river, which here is full of sharp turns and twists. The path crosses the river and follows it down through a narrow gorge for some miles, under trees the whole way, sometimes rising steeply to get over some precipitous part of the hill-side, but for the most part keeping close to the river. Now and then huge logs would be carried down past us, bobbing and plunging like a ship in a rough sea, for there is a great deal of timber cutting going on just now, and the logs as they are cut are rolled down the hill side into the river and are carried down for miles and miles, I suppose right into Srinagar. A great many of the logs stick on rocks in the stream, and these hold up others, and soon the block becomes so bad that no more can pass (fig. 6). Then down comes a gang of coolies armed with long poles, and they roll away as many as they can. One or two always resist any attempt to move them from the bank, and then a coolie has to go in after them, stripped

to the skin, and with a thick rope tied round him to prevent his being carried away by the stream. He climbs on to the rock and levers off the log with his pole, and is then dragged back to the bank by means of the rope.

On the way down we met dozens of ponies all very heavily laden, on their way, so the pony men told us, to Ladahk. One of the men said with pride that they were taking the baggage of the Joint Commissioner of Ladahk up to Leh, which is about 180 miles away. Another one told us that all the ponies had far too much to carry, and that if we met the Commissioner, who was following after, we were to tell him so. Soon we met the Commissioner himself, riding at the head of an equipage of Indians and Ladahkis and Kashmiris, and he said good morning to us as he passed. One of his followers, obviously a Babu, unaccustomed to riding, was sitting sideways on his horse to avoid a sore place, and when we grinned at this, the troopers who were with him burst out laughing. As the Babu has to ride for the next fifteen days, or else walk behind the horses for the hundred and eighty miles into Leh, I don't envy him.

July 18.

Koolan to Camp at Yem Sar.

Our camping place at Koolan last night was a bad one, as it was too near the village, and so there were many flies. The coolies were against our camping there as they said the place was full of snakes. Luckily none came our way.

Our camp for to-day at Yem Sar, a small lake just under the Yamheur Pass, is about 12,200 feet high or more, so that between breakfast at Koolan and tea up here, we have climbed about 5,000 feet. The path goes through dense forest, straight up the hillside, and there are no views to be had till you climb nearly 3,000 feet and come to Zaiwan, a small clearing with a few shepherds' huts. We must have done that in record time, for "Neve's Guide" says it takes two and a half hours to go down from Zaiwan to Koolan, and it did not take us more than one and three-quarter hours to come up.

The coolies passed us here as we were sitting resting, and that was the last we saw of them till we got right up. They are most energetic to-day, probably because we are on the homeward way, so much so that we had difficulty in persuading them to stop at Yem Sar. They were all very keen to go right on over the pass, although it was three in the afternoon when we arrived. As that would have meant a climb of over 6,000 feet in one day, and a long walk down the other side, I had to be firm and say we had had quite enough. It had been pouring from about 1 o'clock, and we were right in amongst the mists, a most dismal experience when you have to camp and stay there. The whole of the climb up from above the forest-line was very dreary, as there were no trees and no sun, and except for the

multitude of flowers it would have been most depressing. The flowers were marvellous, just as they were on the Zogi La, and most of them were by now familiar to us.

On the Zogi La, however, the general colour of the flowers was blue, and there would be patches here and there where the whole ground would be blue with forget-me-nots. Here almost all the flowers are bright yellow potentillas, and an extraordinary thing is that the anemones which are mostly blue or white on the Zogi La and elsewhere, are all yellow here. Possibly they are able to take the colour of the prevailing flowers, sc as to obtain equal attention from the bees.

Our camping ground is a mass of these yellow flowers, and they brighten up the whole place, and almost make one think the sun is shining.

Looking up at the pass from outside our tent, which is about 1,000 feet below its summit, it seems impossible that we should ever be able to get over it. There is a rocky wall with great snow patches over it, and our path certainly leads across it somehow, but where, goodness knows, for we certainly cannot see it from the camp. Indeed, to get over it looks from the camp more the task of a properly-equipped mountaineering party than that of a crowd of laden coolies with nothing but grass chupplies on their feet.

July 19.

Yem Sar to Lidarwat.

To-day was a beautiful day, clear and cold, and just the day for mountain climbing. Our bearer gave us breakfast at seven and remained behind with the coolies to pack up the camp, while we started off with a new man we had engaged in Koolan, who knew the pass and who came provided with an axe for making a way through the snow. The pass turned out to be quite easy, I mean not dangerous, except in one place only. The way up to it led first through a maze of rocks and boulders, then crossed a patch of snow, in which our coolie cut steps for us, as it was difficult to keep one's feet owing to the slope of the snow. After the snow, more rocks for a bit, climbing steadily, and then came the difficult part. We had to cross a long snow slope at a very steep angle with nothing below it at all but a precipice falling down into the little lake at the bottom. We had heard that several parties had come up to this point intending to cross the pass, but had turned back for various reasons, probably for want of a rope. Luckily I had brought a rope for just such an emergency, and C. and I tied ourselves on to it, and sent the coolie in front to cut steps. We got across without any trouble, and soon found ourselves right on the top of the pass. The view was magnificent, right down into the Sind Valley, and almost to the river itself, six or seven thousand feet below. Indeed, we could see the houses of a village by the river, and we took it to be Koolan. Across the valley we saw range after range of mountains, right across to the snowy mass of Nanga Parbat itself, about fifty miles away.

As the hills were so clear we decided to stay on the top for a while, and we climbed up above the pass along a ridge of rock on its east side, reaching a height of over 14,000 feet. Here there was a tiny patch of grass, and as it was some three hours since breakfast, we made some tea on the spirit stove, and sat down for an hour to admire the view. Nanga Parbat was still visible, but soon clouds came down the Sind Valley and hid it from view. The effect of the height (14,000 feet) was little felt. In fact it was only when actually climbing that I noticed it, and then only in the form of a little excessive shortness of breath, necessitating more frequent rests. Apparently it had no effect on C. at all, unless the sudden unaccountable appearance of a black eye was produced by the bursting of a small vessel, due to the strain of climbing.

The climb down from the pass to the camping ground of Sekiwas, and indeed almost the whole way to Lidarwat, was uninteresting, nothing but a steady drop down over rocks and boulders amongst the most desolate scenery. A marmot got up once from the rocks and shrieked at us as marmots do, whether from fear or to frighten us I do not know. Their cry is something like a railway guard's whistle, but very loud, and in these desert places almost weird. It is usually the first sign that there are marmots about, for they are very difficult little animals to see amongst the rocks. We got within a hundred yards of this one, and through field glasses he looked just like a large guinea-pig. He was very much on the watch, for all of a sudden he dived down into the ground, and we found his hole afterwards, much too deep for us to get at him. An officer on leave, whom we met in the Sind valley, had just shot ten of them up at the Gangabal Lake to make a fur coat out of their skins.

Lidarwat, our camp for to-night, is fourteen miles from Pahlgam, which we now look on as home. We are both agreed, now that we have just come from the Sind Valley, that it is not nearly so beautiful as the Lidar. There is no hint of desolation in the Lidar Valley. There are trees and green meadows all the way, and trees, especially deodars, do make a difference in one's opinion of a place. Not that there is much of the desolate in the Sind valley except above Sonamarg, but it somehow has not the friendly, homely appearance of the Lidar.

We expect to reach Pahlgam to-morrow afternoon, and then it will be necessary to make arrangements for returning to Lahore by August 1. How I hate the plains and work just now !

Current Literature.

Annual Report of the Chief Medical Officer of the Ministry of Health for the Year 1925. (London: Published by His Majesty's Stationery Office. Pp. 240. Price 2s. 6d.)—The opening section deals with statistics, then follows general epidemiology, etc. In dealing with smallpox, the report states that this disease has shown a steady increase in its incidence from 315 cases in 1921 to 5,365 in 1925; but the disease is, for the most part, of a mild character with low mortality. With regard to vaccination, no infants or young children up to 11 years of age, who had been vaccinated and showed cicatrices were attacked by smallpox; but when considering the mortality among vaccinated persons who suffered from smallpox the report shows that during the years 1919-1925 the fatality-rate was greater among the vaccinated than among the unvaccinated; the reason for this it explains is that the fatal cases among vaccinated persons generally occurred many years after vaccination. A committee on vaccination has been appointed to inquire into: (1) the preparation, testing and standardization of lymph; (2) the methods of diminishing or removing any risks resulting from vaccination; (3) the methods of vaccination most appropriate to give protection in epidemic and non-epidemic periods.

An account is given of two outbreaks of scarlet fever traceable to milk; the first occurred in Keswick, where the source of infection was traced to a boy milker; the second outbreak occurred at Lytham St. Ann's. Considerable progress has been made in the treatment of this disease with an antitoxic serum prepared from horses; also in the diagnosis of doubtful rashes with the Schultze-Charlton blanching test, using a similar antitoxin. In Aberdeen experimental work has been carried out by inoculating children against diphtheria and scarlet fever, by mixing the diphtheria toxoid-antitoxin and the scarlet fever toxin: three injections being given at intervals.

In immunization against diphtheria, toxoid-antitoxin is the mixture now used in this country. Toxoid is toxin treated with formalin; it is non-toxic, but retains its immunizing powers. Toxoid alone gives a lower percentage of immune children than the old toxin-antitoxin mixture. Research is now aiming at trying to reduce the three doses required at present for immunization, to two or even one; and also at combining the susceptibility test with the first treatment dose.

The writer points out that in the prevention of influenza by throat gargling and nose washing, "the experience of recent years tends rather to discredit these measures, particularly the latter, as liable to spread the infection to the ear and nasal sinuses, although the risk may be easily exaggerated."

The work done on experimental measles would appear to indicate that:

(1) measles, if uncomplicated, is a mild and non-fatal disease ; (2) it is due to a filterable virus not yet isolated ; the virus is present in the buccal and nasal secretions, and also in the blood of patients suffering from the disease, at least during the first thirty hours of the eruption. Much research into the prophylaxis of measles has been done ; the serum of patients convalescent from the disease has been employed with successful results by some workers ; the immunity produced is, however, transient, lasting for only two to three months.

The treatment of general paralysis of the insane by induced malaria has raised the questions : (1) Whether cases of malaria so induced must be notified ? (2) What steps are necessary to prevent the accidental spread of the disease from inoculated cases ? The serious objection of inducing malaria by direct inoculation of blood from G.P.I. patients to other patients has been considered ; and it has been decided that a central supply of a pure strain of the benign tertian parasite should be made available. An isolated block of the Horton Mental Hospital has been mosquito-proofed to provide a treatment block for these cases, and a laboratory for preparing and maintaining a suitable strain in mosquitoes.

An interesting case of cowpox occurred at Chippenham, where a farmer and his son and daughter were infected with cowpox from cows suffering from the disease. The son and daughter, who had never been vaccinated, were seriously ill, but the father, who had only been vaccinated in infancy, had no constitutional symptoms.

The results of work on cancer are discouraging ; in the last forty years the mortality-rate for the disease has more than doubled ; this is a remarkable contrast to the figures for tuberculosis, the rate for which is now less than half what it was at the beginning of the same period.

Under the heading Tuberculosis, the six functions of a dispensary as set out by the Departmental Committee are : (1) Receiving house and centre of diagnosis ; (2) clearing house and centre of observation ; (3) centre of curative treatment and supervision of domiciliary cases ; (4) centre for the examination of contacts ; (5) centre for "after-care" ; (6) information bureau and education centre.

The true principles of sanatorium treatment the Report states are (*a*) prolonged treatment of suitable cases ; (*b*) treatment must be commenced in the early stage for permanent arrest of the disease ; (*c*) appropriate therapeutic treatment, suitable dietary, an open-air life, rest, graduated exercise and occupation ; (*d*) education and prevention ; (*e*) an effective system of after-care.

The following reasons are then given to explain the relative failure of sanatorium treatment, which in the past has not yielded its full value : (1) Late application of patients for treatment ; (2) unwillingness of the patient to submit himself to the required regime ; (3) failure in selecting suitable cases ; (4) failure in administration of the sanatorium ; (5) inadequate arrangements for after-care.

The special lines of treatment suggested are: artificial pneumothorax, phrenic evulsion, apicolysis, thoracoplasty and administration of gold-salt (sanocrysin). A trial of the Spahlinger treatment is to be made as soon as a supply of the material is available.

In the section dealing with maternity and child welfare is found a useful table of birth-rates and death-rates and of infantile mortality from 1900 to 1925: in the former year the birth-rate was 28·7; in 1925 it was 18·3, which is the lowest birth-rate on record, excluding the war years, 1917-1918. During the same period the death-rate has fallen from 18·2 to 12·2, and since the beginning of the century there has been a remarkable decrease in the infant mortality from 154 to 75.

Under Food it is pointed out that the Milk (special designation) Order 1923, requiring "pasteurized" milk to be held at 145° F. to 150° F. for half an hour, has had the effect of precluding the use of "retarders," in which, owing to "eddying," some of the milk escapes before the required time, with consequent imperfect pasteurization.

An interesting case of blowing of tins, due to chemical action alone, occurred in connexion with a consignment of imported canned loganberries. The lacquer on the inside of the tins had given way in places, allowing the tin to be dissolved and the exposed iron to be corroded by the fruit juices, with the production of H, N, O, and CO_2. The contents of the tins were sterile.

Special inquiry has been made into the measures indicated for the prevention of acute rheumatism and subsequent heart disease, the measures include: (1) All measures for improvement of environment, such as town planning and proper situation of houses, the protection of the house from damp: increased light, ventilation and diminished over-crowding in all rooms, especially in sleeping quarters. (2) All measures for increasing the resistance of the individual. (3) Treatment of septic conditions of tonsils and teeth and of catarrhal conditions of the nasopharynx. (4) Provision of special institutional accommodation for (*a*) the treatment of the acute stage; (*b*) for prolonged special treatment of the convalescent stage. (5) Special supervision subsequent to discharge. (6) Investigation into the ætiology of the disease.

The report should be read by all officers preparing for the D.P.H. examination; the subjects which it is considered should be specially noted are those dealing with: (1) smallpox in the unvaccinated; (2) immunity against scarlet fever and against diphtheria; (3) the section on tuberculosis; (4) the Milk (special designation) Order, 1923, and "retarders." J. G. R.

The Course of Typhoid Fever in Persons who have been protectively inoculated. By Dr. F. W. Schembra. *Münchener medizinische Wochenschrift*, August 20, 1926.

The author of this paper contributes further evidence of the efficacy of antityphoid inoculation in combating epidemics of typhoid fever in civil practice.

In dealing with an epidemic of typhoid fever at Anklam (Germany) during the summer of 1925, protective inoculation of the population was commenced on July 10, shortly after the outbreak of the epidemic, and by the middle of the month inoculation was being carried out on a large scale.

Antityphoid vaccine was administered in the usual way in doses of 0·5 and one cubic centimetre at intervals of seven days, and in some cases apparently three injections of the vaccine were given. Children were inoculated with reduced doses. In all, about 15,000 persons were voluntarily inoculated and no bad effects were observed.

It is not claimed that inoculation will ensure absolute protection, but the author is convinced of the importance of protective inoculation as a means of limiting the spread of an epidemic and of reducing the severity of the disease in those who become infected subsequent to inoculation. But, of course, protective inoculation alone is not considered sufficient; the necessity for sanitary measures and for the strict isolation of those suffering from the disease and of all suspected cases is emphasized. In patients who have been inoculated the disease was milder, of shorter duration and complications were less frequent than among patients who had not been inoculated. The statistics of mortality also were favourably affected; for inoculated patients the figures were 4·3 per cent (i.e., 3 deaths in 70 cases) as compared with 13·6 per cent (i.e., 19 deaths in 140 cases) amongst the non-inoculated.

It was exceptional to find inoculated patients suffering from severe forms of the disease, and in cases where severe infections occurred it was found, either that the patients had disregarded the illness in its early stages and had not come to hospital until their condition became serious, or that they had been inoculated towards the end of the incubation period and in some instances even after the outbreak of the disease, when they could hardly be classified as protected individuals. Clinical notes illustrating these exceptional cases are given. In one case the patient had been inoculated three times (presumably having received three doses of the vaccine) three weeks before the onset of the illness; intestinal hæmorrhage occurred with fatal result. Another case, inoculated with one dose of vaccine ten days before the onset of illness, developed a fatal broncho-pneumonia; and a third case, inoculated twice during the initial stage of the disease, also died from severe intestinal hæmorrhage.

It would appear that in two of these cases the patient had been inoculated too late to allow for the development of immunity before the onset of the disease, and in the third case inoculation after the disease became manifest was of no avail.

It is of interest to note that after the general introduction of protective inoculation the diagnosis of the disease in inoculated patients was more difficult and was often based on clinical evidence only. In these cases the degree of fever was slight and its duration was short, there was an absence of stupor, and splenic enlargement was no guide, as swelling of the spleen

generally follows inoculation. The pulse was retarded, but as a rule there was no dicrotism. The Diazo reaction frequently failed and the white blood-count was of uncertain value. There was one sign, however, which remained constant in all degrees of the illness in inoculated patients, and that was the typical typhoid tongue.

In the Anklam epidemic typhoid bacilli were isolated from the blood in 46·4 per cent of inoculated patients, whereas the specific bacillus was isolated in 54·3 per cent of patients who had not been inoculated.

It is recorded, however, that Schottmüller working elsewhere succeeded in isolating the microbe from ninety per cent of non-inoculated patients, but apparently only after repeated examinations; whereas in the Anklam epidemic only one bacteriological examination was made in each case. It is stated that in many cases *Bacillus typhosus* could not be isolated from the blood of inoculated patients because of the formation in their blood of antibodies that were inimical to this germ; and the explanation is supported by the fact that the growth of cultures of the typhoid bacillus was much retarded if the blood of inoculated individuals was added to the medium.

Reference is made to a case of afebrile typhoid in an inoculated individual. The patient was under observation from the sixth to the thirty-eighth day of illness; he had no fever whatever during this period, though *B. typhosus* was isolated from his blood.

The author states that caution is required in utilizing the Gruber-Widal reactions in the diagnosis of typhoid fever in inoculated patients, and should be considered only in association with the clinical symptoms.

Reviews.

METROPOLITAN WATER BOARD: TWENTIETH ANNUAL REPORT. By Sir Alexander Houston. Published by P. S. King and Son, Ltd., 2 and 4, Great Smith Street, Westminster. Price 21s.

On opening the Twentieth Annual Report on the London water supply, the reader will probably be pleasantly surprised to find that he is, apparently, immersed in an historical novel instead of the pages of statistics and analytical data usually associated with such a report.

The first part consists of an article entitled, "The Romance of the New River," in which Sir Alexander Houston describes how the idea of safeguarding the water supply of the metropolis was put into execution by Sir Hugh Myddelton 300 years ago, when he brought pure water from the Chadwell and Amwell springs to London by an artificial channel then forty miles long. The difficulties met and overcome by Sir Hugh Myddelton are explained and tribute is paid to what the author believes to be one of the finest achievements in the annals of preventive medicine.

The reader is then taken for an imaginary walk along the course of the stream from the intake just above Amwell pond to the New River

head at Clerkenwell, the account being interspersed with photographs' maps and interesting quotations. The following two sections deal with the chlorination of Thames and New River water. The author points out the advantages of this method both from a point of view of reducing cost and improving the bacteriological standard of the water. The process of chlorination is described, as are also experiments conducted to ascertain the value of permanganate and ammonia both as taste preventers and as tending to increase the sterilizing action of chlorine.

Section III deals with the presence of leptospiras in water, these organisms being found apparently in filtered as well as in raw water. Comfort may, however, be taken from the author's opinion that, with perhaps one rather puzzling exception, the leptospiras found in water are innocuous and are, in any event, killed by efficient chlorination. The importance of rats in relation to leptospiral infection is also noted.

Section VIII (miscellaneous) contains several items of interest. The connexion between goitre and water supply is discussed. The opinions of Sir James Berry and Dr. James Wheatley are put before us. It is interesting to note that the explanations advanced by these two eminent authorities are totally divergent. The author, however, refrains from committing himself to a definite opinion.

As regards swimming baths, the author advocates the use of chlorine for purification purposes.

On page 77, *et seq.*, further experiments on the use of chlorine as contrasted with chlorine + ammonia are described.

The beneficial ultimate effects of the latter process are shown, but the author draws attention to certain possible disadvantages as regards the application of this process to the Metropolitan water supply. It might be noted that the actual technique differs from that advocated by Harold.

The report ends with a series of analytical results for each month of the year.

G. D. J.

TEXT BOOK OF PUBLIC HEALTH. By E. W. Hope and Stallybrass. Edinburgh: Messrs. E. and S. Livingstone. 1926. Pp. x + 336, with 71 illustrations. Price 15s.

The present volume is the ninth edition of this well-known textbook, in which the contents have been largely rewritten and some new chapters have been added.

The initial chapter upon public health legislation includes all the recent additions to and alterations of sanitary law and organization—no small task at the present time—and is notably complete and up to date; it furnishes an exceptionally good summary of the subject. Other chapters of special value are those dealing with general epidemiology, vital statistics, the health of the school child, and occupational hygiene.

The authors state that the main object of the volume is to provide a textbook for students and practitioners reading for the Diploma of Public Health, and for this purpose the book can be confidently recommended.

For other readers, however, it suffers from the defects inevitable in a book written chiefly from the examination point of view; information is concentrated and compressed, and dogmatic statements take the place of discussions.

In several places there are evidences of hurried—even careless—revision, which the authors should find time to correct in a future edition, from which also, we hope, they will omit those descriptions of analytical methods, whose proper place is in a practical laboratory handbook.

The book is essentially one for the candidate facing his D.P.H. examination; he will find it of great value. J. A. A.

THE HOUSE-FLY. By Major E. E. Austen, D.S.O. Pp. 61. British Museum (Natural History). Price 1s.

The popularity and consequent exhaustion of the first edition of this booklet have led to its republication in expanded form. The new volume, like its predecessor, is the work of Major E. E. Austen, and appears with the imprimatur of the Trustees of the British Museum. In the space of 61 pages the author gives a clear account of the natural history and zoological relationships of the house-fly, emphasizing its importance as a vector of disease, and explaining in detail the methods of suppressing these disgusting pests. This is not an academic treatise for the delectation of those who profess the mysteries of entomology; it contains nothing incomprehensible to persons of ordinary education, for the author, with admirable skill, excludes any technical jargon which might impede the easy flow of his narrative.

Presumably the precepts laid down in this volume are known to those professionally concerned with preventive medicine, but everyone who possesses a garden, a stable, or even a dustbin should be equally familiar with Major Austen's teaching, and translate it into practice; he owes this duty to his neighbours. Even small children should realize that the house-fly is a filthy creature, not to be tolerated within our houses. Some simple instruction towards this end would profit them rather than being taught, like some children of the reviewer's acquaintance, William Oldys's poem inviting the "Busy, curious, thirsty fly" to come and share the poet's meal. O, William! William! A sad retrogression from old Dan Chaucer's pilgrims three centuries earlier who attributed their attacks of food poisoning to the "many a flyë loos" in the Cook of London's shop.

W. P. MACA.

PRACTICAL MATHEMATICS. By F. Percy Roe, Army Educational Corps. Aldershot: Gale and Polden. Pp. xiii + 201. With 8 figures. Price 6s. 6d.

This useful little book is a guide to first-class and special certificates, and is one of the educational books published in Gale and Polden's Army Educational series. In his preface the author remarks that if it succeeds in showing the soldier candidate that mathematics is a definite necessity

in everyday life and work it will have realized a part of its ambition; and that if it pulls him through his examination it will have fulfilled its purpose. We feel confident that both the ambition and the purpose will be attained by anyone who studies the book carefully and works out the exercises included in it. The subjects cover a restricted range in arithmetic, geometry and algebra, and the book concludes with a chapter on graphs and graphical representation, with examples of algebraical and problem graphs. A temperature chart is introduced as one of the specimens of the latter. It is described as a malarial curve, but we do not recognize it as such. It resembles more a typhoid chart, with commencing lysis; but it is a good representation of charting temperatures by means of ordinates and abscissæ. We can thoroughly recommend the book to candidates for examinations in the subjects with which it deals; and it is also a useful little book for those of us who have long since passed the stage of examinations, to have at hand for reference when we find that our knowledge of mathematics has entered the realms of oblivion.

THE SECRETION OF THE URINE. By Arthur R. Cushny, F.R.S., late Professor of Materia Medica and Pharmacology in the University of Edinburgh. London: Longmans, Green and Co., Ltd. Second Edition. 1926. Pp. xii + 288. Price 16s.

The first edition of this work received universal recognition as an authoritative and effective summary of the state of our knowledge of kidney secretion and now, nine years later, this second edition embodies the results of more recent research in the same direction.

An important part of this new work has been devoted to the fundamental theory of renal activity which has vexed physiology so long; and it is beyond question that the new evidence has greatly strengthened the point of view which was advocated in the first edition.

A number of important advances have been made in other directions: it is only needful to mention those in respect of the pituitary action, diabetes mellitus and the theory of nephritis, which promise to fall into line with the physiological activities.

It is often complained that the physiology of the kidney, as given in the textbooks, is made up of a wrangle between the two divergent views of its activity. Here the different views are presented, and one is advocated that differs in some respects from any that has been accepted hitherto, and which embraces some of the features of each of its precursors. It is based largely on physical chemistry as well as on the direct observations of physiologists, and it appears to conflict with no ascertained fact in physiology.

As the fundamental nature of kidney activity has long been a subject of controversy, it is unlikely that Cushny's theory represents the final solution of this subject.

It is, however, a milestone on the road to truth, and it is much to be regretted that the author died so suddenly before this book was published.

J. W. H. H.

Notice.

THE WAR SECTION OF THE ROYAL SOCIETY OF MEDICINE.

As only a relatively small number of R.A.M.C. officers are members of the War Section of the Royal Society of Medicine, a state of affairs which is without doubt largely due to the fact that many are ignorant of the existence of the Section, it has been thought desirable to write this short note so that the matter may be brought to the attention of all who are interested.

Prior to 1919 there existed the United Services Medical Society, a society whose objects were to further scientific progress within, and co-operation among, the Medical Services of the Army, Navy, and Air Force. In 1919 it was decided that the society could more conveniently function as a Section of the Royal Society of Medicine, and steps were taken which led to its ultimate embodiment as War Section of the latter society.

The terms of membership are simple. All registered medical practitioners are eligible; application must be made on the form obtainable from the Secretary, and must be supported by signatures of two members of the Section. A member of the Section can attend the meetings and take part in the business of the Section, and is eligible for office. (He is not *entitled* to attend the meetings of other Sections, but is usually welcome to attend as a guest.) On application he receives the *Proceedings* of the Section, together with full index. He may use the Library (for reference and reading only) on payment of an annual library subscription of £2 2s. (This is of course purely optional, but as the library is the most complete medical library in the country, the privilege is a valuable one to those doing work which involves the reading of references.) The annual subscription for membership of the Section is £1 1s. There is no admission fee. Fellows of the Society can become members of the Section without further subscription.

Six meetings of the Section are held each session at the house of the Royal Society of Medicine, 1, Wimpole Street, W.1. As a rule the business takes the form of the reading of a paper on some subject of general interest followed by a discussion thereon in which members are invited to take part. The following is the provisional syllabus for the remainder of the current session .—

December 13, 1926, at 5 p.m.

"Thomas's Splint Drill."

Cinematograph film shown by Lieutenant-Colonel E. M. Cowell, D.S.O., R.A.M.C. (T.A.).

"Abdominal Hernia in the Royal Navy." Paper by Surgeon-Commander H. E. R. Stephens, O.B.E., R N.

February 14, 1927, at 5 p.m.

"Service Architecture and the Requirements of Accommodation in Tropical and Sub-Tropical Countries, with Special Reference to Egypt and Palestine." Paper by Squadron-Leader P. M. Keane, R.A.F.

March 14, 1927, at 5 p.m.

"Diet and Disease in the Royal Navy." Paper by Surgeon-Commander C. H. Dawe, R.N.

April 11, 1927, at 4.30 p.m.

Annual General Meeting.

"The Medical Services and Man-Power." Paper by Major T. J. Mitchell, D.S.O., R.A.M.C.

One of the best features of the meetings is the opportunity afforded of making the acquaintance of, and exchanging views with, members of the sister Services. A buffet tea is served half an hour before each meeting, and the ensuing half hour is always one of pleasant converse with friends old and new. In the same way the value of the discussions on the papers is greatly enhanced by the fact that views are expressed by members of all three Services. Unexpected points of view are frequently brought forward to the mutual advantage of all.

Officers desirous of becoming members of the Section are invited to apply for the necessary forms to the Honorary Secretary for the Army, Major J. S. K. Boyd, R.A.M. College, who will also be pleased to supply information regarding the Fellowship of the Society to any who may be interested.

REOPENING OF THE WELLCOME HISTORICAL MEDICAL MUSEUM.

The Wellcome Historical Medical Museum contains an extensive collection of rare objects, pictures, sculptures, manuscripts, early printed books, etc., illustrating the evolution and practice of medicine and allied sciences throughout the world from prehistoric times, and includes a section dealing with primitive medicine, surgery, and the healing arts among savage and semi-civilized peoples of to-day.

Special sections are devoted to memorial objects associated with eminent medical men who have made history by their great achievements in medical science. These include Dr. Edward Jenner's manuscripts and instruments, and also Lord Lister's original appliances, chemical reagents and other materials which he used in the development of his methods of antiseptic surgery. A portion of the original "Lister Ward" in the Glasgow Royal Infirmary has been reconstructed from the actual material and fitted with the original equipment, and forms an important exhibit in the museum.

The aim of Mr. Wellcome was to make the collections of real educational value and of use to research workers, students and those interested in the history of medicine.

The museum was first opened on June 24, 1903, by Sir Norman Moore. Since then it has been expanded to such a degree that it became necessary to close it for eleven months for complete re-organization, and it is now virtually a new museum.

The museum was reopened, on October 14, by Sir Humphry Rolleston, who, in his opening remarks, referred to the value of the collection and to the debt we owe to Dr. Payne, Sir William Osler, Sir Clifford Allbutt and Sir Norman Moore, for their encouragement of the study of medical history in this country.

Sir Arthur Keith then gave an address on " What should Museums do for Us." He said he often thought of Thomas Buckle writing his " History of Civilisation in England," surrounded by thousands of manuscripts, documents and books. Buckle believed that history could only be written in this way; he did not perceive that geologists had discovered a new way of writing history by deciphering things and not words. When the

Copyright. *Wellcome Historical Medical Museum.*

Hall of Statuary, looking north—Wellcome Historical Medical Museum.

geologists began to arrange their fossils in an orderly way on the shelves of a museum, that museum became not only a history of the earth but of all the living things that had appeared on it during past times. Presently it was discovered that the early history of man himself could be written in this way. Pitt-Rivers had demonstrated how reliable human history could be built up bit by bit in the shelves and show-cases of a museum. What Pitt-Rivers had done for human culture in general Mr. Wellcome had sought to do for a great branch of human knowledge—all that pertained to the art and science of healing. He had ransacked the world and brought together under one roof a vast assortment of materials for the history of medicine, such as had never before been seen or studied in any country.

The foundations of medicine were laid on leechcraft, witchcraft and priestcraft; the early physician was also magician and priest. Unless this truth was grasped it was impossible to understand Mr. Wellcome's "Hall of Primitive Medicine," for this hall contained a wealth of amulets, charms, talismans, mascots, totems, fetishes, idols, masks and ceremonial dresses—the therapeutic artillery of ancient physicians. In Harley Street the counterparts of the native artillery were the stethoscope, the bismuth meal, note-book for prescriptions, and a certain professional air. As visitors walked through the Hall of Primitive Medicine, and saw the weird and uncouth equipments of native witch doctors which cover its walls and fill its cases, they might consider these exhibits as mere flotsam and jetsam from the Dead Sea of Medicine, which enlightened England has long since swept away. But when mascots were seen on the motor cars of the wealthy, and charms and amulets were treasured by many people, both rich and poor, ignorant and educated, when the quack was preferred to the man who had given his life in the study of rational medicine, and when learned men called in spirits to explain unusual phenomena, then it was not quite so certain that this part of Mr. Wellcome's Museum did represent altogether a past stage of things. In all of us there still remained more than a trace of the primitive man.

The function of a museum was to foster knowledge, and the money invested in it bore fruit in leaders and teachers. It must be more than a storehouse of material for students; its staff must be students themselves, permeated with a love of knowledge and knowing how to extend it. Besides being active members of learned societies, they must give direct education, which needed much discrimination and the art of the window-dresser. Finally, by helping poor men to produce great work, museums were a worthy use of wealth in the service of the community.

A vote of thanks to Sir Humphry Rolleston and to the founder was carried with enthusiasm and acknowledged by Dr. C. M. Wenyon, Director-in-chief of the Wellcome Bureau of Scientific Research.

At the close of the ceremony the visitors were conducted through the halls and galleries, and the various additions to the collection were pointed out. In the arrangement of the collections the evolutionary idea has been followed as far as possible: for example, in the representative collection of instruments employed in surgery from the earliest times, the history of each instrument may be studied separately. The historical development of dental instruments is admirably shown; and again, the full history of the microscope and of ophthalmological instruments can be traced. The portraits, the casts and the reproductions, the personal relics, the rare models (in ivory) of the human body, the prints illustrating various phases of medicine, such as the history of healing by the royal touch, the specimens of ancient drugs, herbs, medicine chests and apparatus, make a most fascinating exhibition. The museum with its contents and a library of 100,000 volumes must have a profound influence on the future of medicine.

INDEX TO VOLUME XLVII.

C.N. = Clinical and other Notes.
C.L. = Current Literature.